

Energy Statement

Abbey Road, Phase 3

03 May 2022

Quality information

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1. Executive Summary

Introduction

AECOM has been appointed by Wates to produce an Energy Statement for the London Borough of Camden (“the Applicant”) Proposed Abbey Road Phase 3 development within the London Borough of Camden local planning authority. The application seeks consent for the ‘*Demolition and redevelopment of Emminster and Hinstock blocks including Belsize Priory Health Centre, Abbey Community Centre, public house and commercial units to provide new residential accommodation (Use Class C3) and ground floor commercial space (Use Class E/Sui Generis) to be used as flexible commercial units, across three buildings ranging from 4 to 11 storeys, along with car and bicycle parking, landscaping and all necessary ancillary and enabling works*’ (“the Proposed Development”).

This Energy Statement identifies how the Proposed Development is addressing the London Borough of Camden’s (LBC) and the Mayor of London’s energy related policies. The new London Plan has been adopted as of March 2021 and this Energy Statement responds to the relevant policies contained within the Plan the most notable of which are:

- London Plan Policy SI2 “Minimising greenhouse gas emissions”
- London Plan Policy SI3 “Energy Infrastructure
- Camden Local Plan (2017) Policy CC1 Climate change mitigation
- Camden Local Plan (2017) Policy CC2 Adapting to climate change

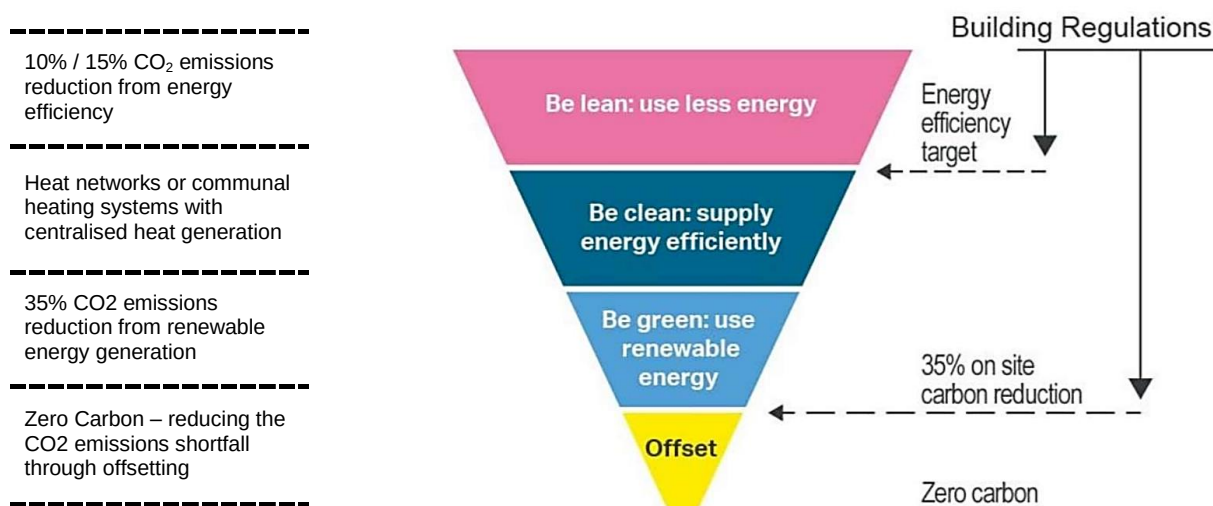
In addition to the policies above, the Greater London Authority Guidance on Preparing Energy Assessments (April 2020) Draft has been followed.

The Applicant intends to seek planning permission for the following:

A detailed planning application for the area directly to the west of the junction of Abbey Road and Belsize Road, within the Kilburn Ward of the London Borough of Camden, involving the addition of 139 units across three blocks, for residential development (Use Class C3); private communal open space, landscaping, residential car parking, cycle parking and associated development. The residential units will be split between the classifications of Social Rent (3,906m² GIA), Camden Living (754m² GIA), Private Sale (8,211m² GIA), and commercial floor space (305m² GIA). The total proposed GIA is 13,003m².

Carbon Emissions Reductions

The Energy Statement follows the GLA Energy Hierarchy. Items relating Whole Life Carbon and Overheating have been submitted separately to this energy statement.



A brief description of the strategy at each energy hierarchy stage is summarised below.

Be Lean	- A fabric first approach has been adopted to reduce energy demand and the Dwelling Fabric Energy Efficiency (DFEE) is less than the Target Fabric Energy Efficiency (TFEE) Part L 2013 target. - The building services will include energy efficient lights, optimised heat distribution and mechanical ventilation with heat recovery. - The domestic units are currently showing a Be Lean CO₂ emission saving of 11.90%. - The non-domestic units are currently showing a Be Lean CO₂ emissions saving of 25.38%.
Be Clean	- The development will be built with a communal heat network and central heat generation. A low temperature hot water loop, with centralised heat sources will distribute heat across all blocks within Abbey Road Phase 3. This will facilitate greater viability for future heat network connections compared to dedicated building or dwelling level heating systems. - Attention will be paid to the specification of the communal network to drive energy efficiency including selecting suitable operating temperatures and minimising distribution losses. - Opportunities to connect into an existing District Heat Network is currently being investigated. A future connection to a local District Heating system will be addressed through the provision of spatial allowances and fittings to facilitate potential future connection.
Be Green	- The communal network's heat will minimise on-site fossil fuel combustion in favour of heat from electric heat pumps. All of the heat from the central energy centre will be produced by systems that use electricity and embraces the National (electrical) Grid decarbonisation programme. This strategy will also help with local air quality considerations when compared with systems that rely on fossil fuel combustion. - The system of centralised air source heat pumps (ASHPs) with electric top-up boilers will deliver low carbon heat with minimal impact to local air quality when compared with systems that rely on fossil fuel combustion. - The non-domestic units are provided with the option to allow the tenant to install localised Air Source Heat Pump (ASHP) / Variable Refrigerant Flow (VRF) systems; this suits the flexible space and will enable the future tenants to install a suitable system to meet the fit-out requirements. - On-site renewable energy generation will be maximised by utilising the available flat roof space to incorporate solar PV panels into the design. - Total on-site carbon reduction is currently targeting a 58.81% saving, exceeding the policy minimum of 35% saving.
Offset	- There is a shortfall to achieving the target of zero regulated carbon emissions, which will be offset in accordance with LBC and GLA requirements. - The residential shortfall is estimated to be 61.26 tonnes/CO₂/year. At a rate of £95/tonneCO₂ over 30 years this results in an offsetting payment of £174,591. - The non-domestic shortfall is estimated to be 3.38 tonnes/CO₂/year. At a rate of £95/tonneCO₂ over 30 years this results in an offsetting payment of £9,633.
Be Seen	- A suitable metering strategy will be developed to record energy consumption. - The developer or ongoing management company will be required to monitor and report the energy consumption and generation as required by the GLA and documented in the recently published draft 'Be Seen' energy monitoring guidance (April 2020)

This strategy has been designed to meet the London Plan targets of zero-carbon buildings, with a minimum on-site 35% reduction in regulated CO₂ emissions for developments. The on-site target has been exceeded and reports a combined reduction of **58.81%**.

Table 1-1. Residential: CO₂ Emissions Summary

	Annual CO ₂ (tCO ₂ /year)	Regulated Emissions, (tCO ₂ /year)	Annual CO ₂ Reduction, (tCO ₂ /year)	Regulated Emissions % Saving	Annual CO ₂ (tCO ₂ /year)	Unregulated Emissions, (tCO ₂ /year)
Baseline Part L 2013 compliance	151.34	-	-	-	80.26	
After 'Be Lean'	133.32	18.02	11.90%		80.26	
After 'Be Clean'	133.32	0.00	0.00%		80.26	
After 'Be Green'	61.26	72.06	54.05%		80.26	
Total Cumulative Savings		90.08	59.52%			
Zero-Carbon shortfall	61.26					

Table 1-2. Non-Domestic CO₂ Emissions Summary

	Annual CO ₂ (tCO ₂ /year)	Regulated Emissions, (tCO ₂ /year)	Annual CO ₂ Reduction, (tCO ₂ /year)	Regulated Emissions % Saving	Annual CO ₂ (tCO ₂ /year)	Unregulated Emissions, (tCO ₂ /year)
Baseline Part L 2013 compliance	5.60	-	-	-	1.31	
After 'Be Lean'	4.18	1.42	25.38%		1.31	
After 'Be Clean'	4.18	0.00	0.00%		1.31	
After 'Be Green'	3.38	0.80	19.06%		1.31	
Total Cumulative Savings		2.22	39.60%			
Zero-Carbon shortfall						

Table 1-3. Sitewide CO₂ Emissions Summary

	Annual Emissions, (tCO ₂ /year)	Regulated Emissions, (tCO ₂ /year)	Annual CO ₂ Reduction, (tCO ₂ /year)	Regulated Emissions % Saving	Annual Unregulated CO ₂ Emissions, (tCO ₂ /year)
Baseline Part L 2013 compliance	156.93	-	-	-	85.88
After 'Be Lean'	137.50	19.44	12.38%	85.88	
After 'Be Clean'	137.50	0.00	0.00%	85.88	
After 'Be Green'	64.64	72.86	52.99%	85.88	
Total Cumulative on-site savings		92.29	58.81%		
Residual emissions over 30 years(t/CO ₂)					

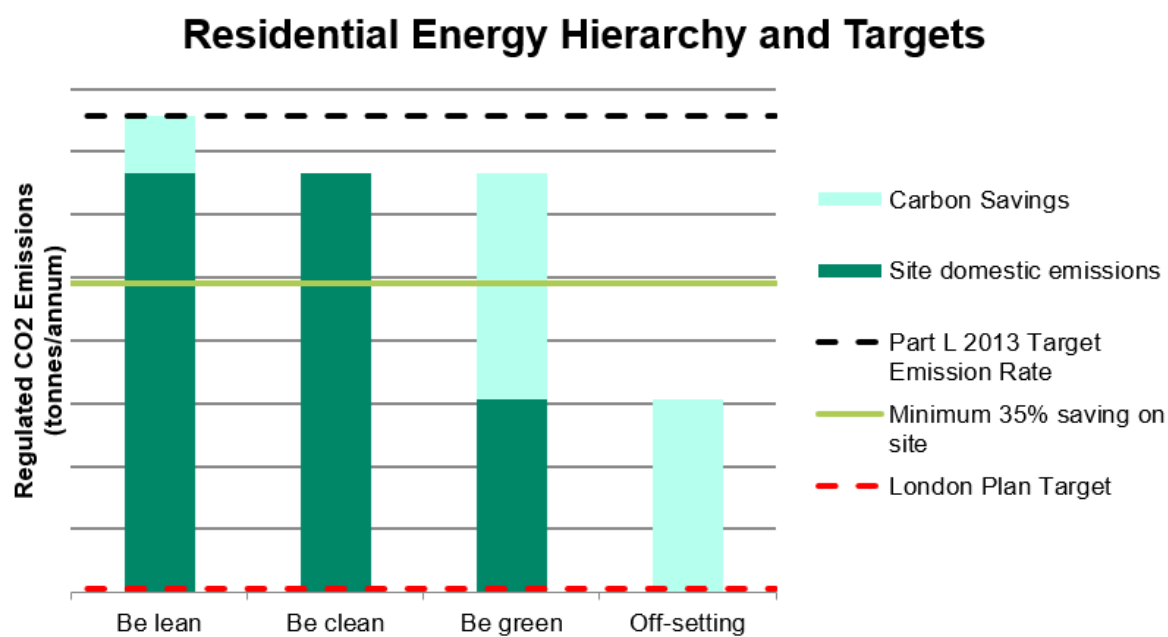
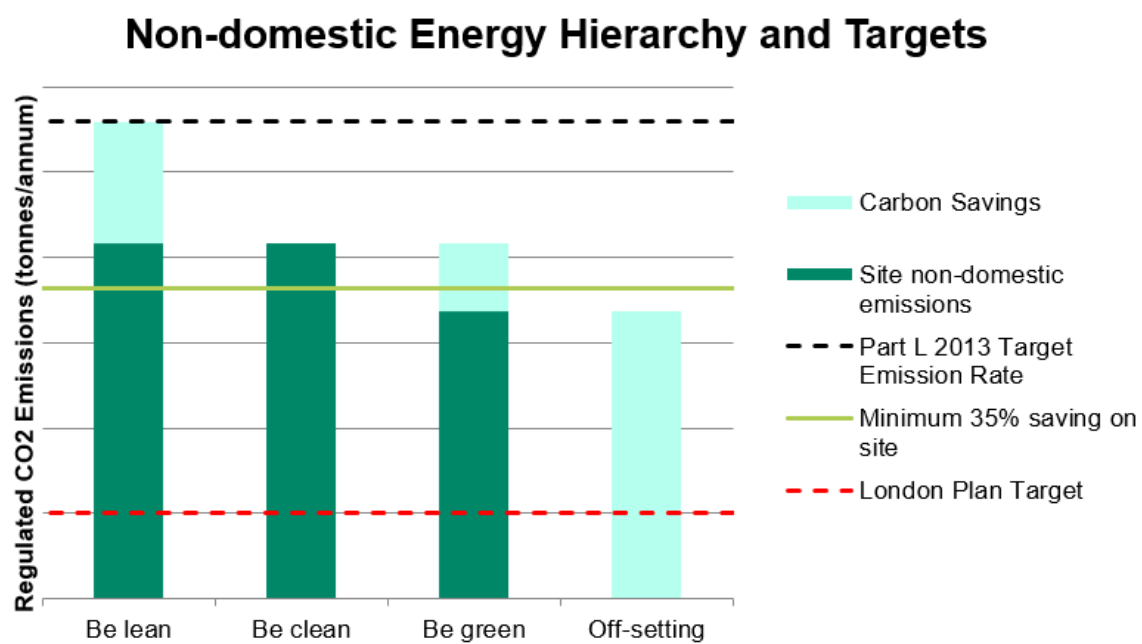
Figure 1-1. Domestic regulated CO₂ emissions reductions at each step of the Energy Hierarchy

Figure 1-2. Non-Domestic regulated CO₂ emissions reductions at each step of the Energy Hierarchy



2. Introduction

Background

AECOM has been appointed by Wates to produce an Energy Statement for the London Borough of Camden (“the Applicant”) Proposed Abbey Road Phase 3 development within the London Borough of Camden local planning authority. This Energy Statement identifies how the Proposed Development is addressing the London Borough of Camden and the Mayor of London’s energy related policies. The New London Plan has been adopted as of March 2021 and it is expected that the Proposed Development will consider all relevant energy policies and adopted Mayoral SPGs. The Energy Statement responds to the relevant policies contained within the Plan.

Site Description

The site is located directly to the west of the junction of Abbey Road and Belsize Road, within the Kilburn Ward of the London Borough of Camden (‘LBC’). It is triangular in shape and comprises the Belsize Priory Health and Community Centre and affordable housing units, which span across a five-storey block (Hinstock) and an eight-storey block (Emminster). The existing residential buildings comprise of 74 units (55 1-beds and 19 studios) all of which were Social Rented units but are now predominantly vacant aside from occupation by property guardians. A number of tenants have already been re-housed within the neighbouring Phase 1 residential development or within other developments in the Borough. In addition to these uses at ground floor there are retail units and a hot food takeaway, as well as a public house, the Lillie Langtry. The common areas on site are comprised of hardstanding and a limited number of trees, mainly along Abbey Road.

The site is bound by the Priory Road Conservation Area to the north and west, by Abbey Road to the east and by Belsize Road to the south. Snowman House, Casterbridge and the new Abbey Road Phase 2 Health and Community Centre (currently under construction) lie to the east on the opposite side of Abbey Road. The completed Abbey Road Phase 1 development lies to the south, on the opposite side of Belsize Road.

Proposed Development

The Applicant intends to seek planning permission for the following:

Demolition and redevelopment of Emminster and Hinstock blocks including Belsize Priory Health Centre, Abbey Community Centre, public house and commercial units to provide new residential accommodation (Use Class C3) and ground floor commercial space (Use Class E/Sui Generis) to be used as flexible commercial units, across three buildings ranging from 4 to 11 storeys, along with car and bicycle parking, landscaping and all necessary ancillary and enabling works.

The detailed planning application for the area directly to the west of the junction of Abbey Road and Belsize Road, within the Kilburn Ward of the London Borough of Camden, involving the addition of 139 units across three blocks, for residential development (Use Class C3) split between the classifications of Social Rent (3,906m² GIA), Camden Living (754m² GIA), Private Sale (8,211m² GIA), and commercial floor space (305m² GIA). The total proposed GIA is 13,003m².

Emission Factors

To calculate the regulated annual operational carbon emissions the carbon intensity of each fuel used on the development is needed. These fuel factors are provided by the Government to calculate regulated operational emissions.

The current fuel emission factors approved for use within Building Regulations Part L 2013, are contained within the ‘Standard Assessment Procedure’ (SAP) 2012 calculation methodology. The GLA Reporting Spreadsheet was released during the consultation stage for the update to Building Regulations Part L 2021 and are the emission factors encouraged by the GLA as part of planning submissions. In December 2021, as part of the update to Building Regulations Part L 2021, the carbon emission factors were further updated to reflect the decarbonisation of the national electric grid.

The table below shows the varying carbon emission factors for mains gas and mains electric. For clarity, the estimated carbon emissions and savings have been presented against SAP10 carbon emission factors, as used on the GLA Reporting Spreadsheet. It is anticipated that the GLA will update their guidance and bespoke reporting spreadsheet in due course.

Table 2-1. Mains Gas and Electric Emission Factors.

	SAP2012 (Part L 2013)	SAP10 (GLA Reporting Spreadsheet)	SAP10.2 (Part L 2021)
Mains Gas	0.216	0.210	0.210
Mains Electric	0.519	0.233	0.136

3. Policy and Drivers

Introduction

The Energy Statement for the Proposed Development has been developed in accordance with national, regional and local policies and legislation that aim to reduce carbon emissions from new development once in operation. The main policies of relevance are detailed as follows.

National Policy and Legislation

UK Climate Change Act

The Climate Change Act (2008) sets a legally binding target to reduce UK carbon emissions by 80% by 2050, against a 1990 baseline. Legislation was subsequently passed in 2019 to extend the target to 100% - Zero Carbon by 2050. The Committee on Climate Change advises the Government on the setting of binding 5-year carbon budgets on a pathway to achieving the 2050 target. The first four carbon budgets covering the period up to 2027 have been set in law. The current budget requires a reduction of 35% by 2020 and the next budget is a 50% reduction by 2025.

This Act is the driver behind a framework of national strategy and policy documents such as the UK Low Carbon Transition Plan (2009) and previously anticipated zero-carbon homes policy. These in turn have informed the development of local planning policy and updates to the Building Regulations.

National Planning Policy Framework

The National Planning Policy Framework dated July 2021 prescribes government planning policy and outlines the way in which this is to be applied. The key sections relating to energy are set out below;

152. The planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure.

154. New development should be planned for in ways that:

a) avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and

b) can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.

155. To help increase the use and supply of renewable and low carbon energy and heat, plans should:

a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);

b) consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and

c) identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers.

157. In determining planning applications, local planning authorities should expect new development to:

a) comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and

b) take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

158. When determining planning applications for renewable and low carbon development, local planning authorities should:

a) not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions; and

b) approve the application if its impacts are (or can be made) acceptable. Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas.

Building Regulations and Future Homes Standard

Part L of the Building Regulations in England is the key mechanism that prescribes standards for the energy performance of new and the refurbishment of existing buildings in the UK, based on metrics such as the estimated level of primary energy demand and CO₂ emissions. The government guidance on ways to meet building regulations provided in Approved Documents sets out the measures required to comply with Building Regulations. Part L 2013 is the relevant and current Approved Document.

On 15th December 2021, the Government published the updated Part L 1A 2021 edition. This document takes effect on 15th June 2022 but does not apply to work subject to a building notice / Building Control application before that date, providing the work is started on site before 15th June 2023¹.

The update to Part L introduces a new compliance metric, in the form of Primary Energy Rate (kWh/m²/yr) to sit alongside the previous Carbon Emission Rate (kgCO₂/m²/yr) and Fabric Energy Efficiency (kWh/m²/yr) metrics. It is understood that Part L 2021 edition also expects a c.30% carbon saving compared to the current 2013 standards for new homes.

The BRE have produced an online beta calculation tool, called iSAP, which is used to estimate compliance against Part L 1A 2021. At the time of writing, this is the only way to estimate compliance against the future Building Regulations Part L. It is expected that an approved version of the software will be available early 2022.

The Future Homes Standards (FHS) are intended to enable homes to become net zero. As it is much more costly to retrofit improved fabric standards, these are expected to become increasingly stringent in moving from Part L 2013 to Part L 2021 and then to the Future Homes Standard.

It is proposed that the Fabric Energy Efficiency (FEE) performance metric will be retained within the FHS to ensure that fabric standards are upheld in line with a fabric first approach. This is to avoid poorly insulated buildings complying through low carbon heating or renewable technologies alone. The FEES will also be supported by the introduction of stricter minimum fabric standards than are currently implemented in Part L 2013 by approximately 15% within Part L 2021.

The Energy Statement for the Proposed Development has been developed to comply with Part L 2013. It is noted that the transitional arrangement period for Part L 2021 applies only where both:

- a) The developer has submitted a building/initial notice or deposited plans by June 2022; and
- b) Commenced work on each individual building by June 2023.

¹ Approved Document Part L, Conservation of fuel and power, Volume 1: Dwellings (Regulations 2010, 2021 Edition) (ISBN: ISBN 978-1-914124-78-5)

Regional Planning Policies (Greater London Authority)

The London Plan (March 2021)

The following paragraphs set out policies within The London Plan that are relevant to energy and which go beyond the requirements of current building regulations. The Energy Statement responds to the relevant policies:

London Plan Policy SI2 “Minimising greenhouse gas emissions” requires developments to be net zero-carbon and to achieve a minimum 35% reduction in carbon emissions on-site. Developers should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy and how it is expected to monitor and report on energy performance. The new Published London Plan requires zero-carbon development for new homes and extends this requirement to non-domestic buildings.

An additional step to the “be lean”, “be clean”, “be green” has been added and is: “be seen”: monitor, verify and report on energy performance.

Domestic development should aim to achieve a 10 percent, and non-domestic development should aim to achieve a 15 percent reduction in regulated CO₂ emissions through energy efficiency measures alone. The evidence base that supports this policy identifies that these targets may be ambitious for certain development types.

Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be offset through cash in lieu contributions to the relevant borough’s carbon offset fund and/or through off-site measures provided that an alternative proposal is identified, and delivery is certain. The cash payments are based on a rate that has increased from £60/tCO₂ to £95/tCO₂ (applied over 30 years).

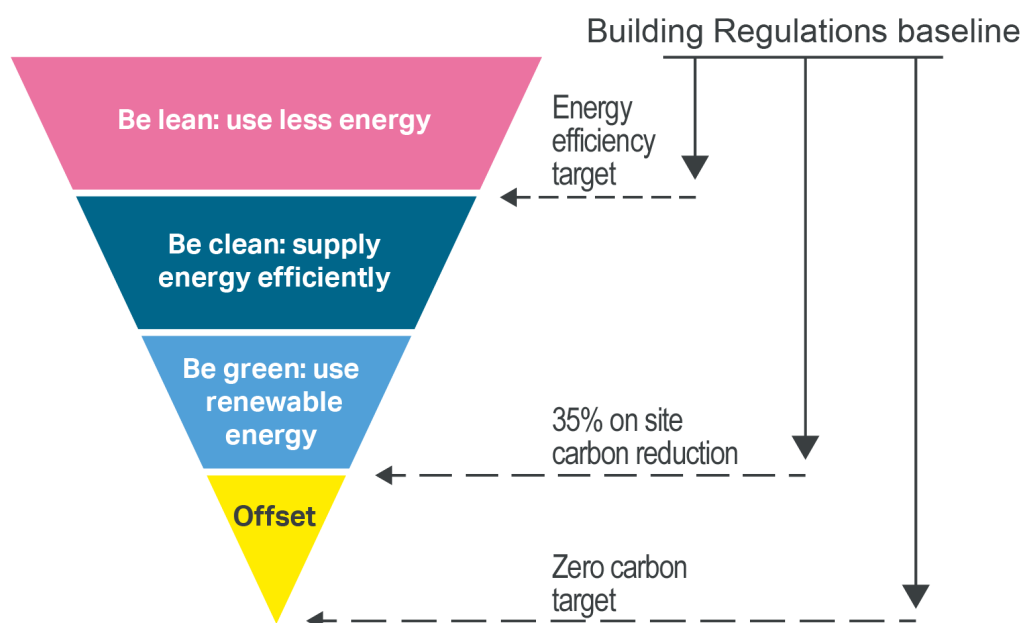


Figure 3-1. Greater London Authority (GLA) London Plan regulated carbon emissions reduction priority hierarchy (London Plan, March 2021)

London Plan Policy SI3 “Energy Infrastructure” changes the hierarchy for selecting heat sources for communal heating systems placing gas CHP engines and gas boilers at the bottom of the hierarchy due to the anticipated change in their emissions saving relative to other sources as National Grid electricity decarbonises. Heat sources for communal heating systems should be selected in accordance with the heating hierarchy:

1. Connect to local existing or planned heat networks
2. Use zero-emission or local secondary heat sources (in conjunction with heat pump, if required)

3. Use low-emission combined heat and power (CHP) (only where there is a case for CHP to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network)
4. Use ultra-low NOx gas boilers

Where a heat network is planned but not yet in existence the development should be designed to facilitate a connection should this be feasible in the future.

A further requirement is that Boroughs should ensure that all developments maximise opportunities for on-site electricity and heat production from solar technologies (photovoltaic and thermal) and use innovative building materials and smart technologies.

Major development proposals should calculate and minimise carbon emissions from any other part of the development, including plant or equipment, that are not covered by Building Regulations, i.e. unregulated emissions.

In addition to the policies above, the Greater London Authority Guidance on Preparing Energy Assessments (April 2020) Draft has been followed.

Local Planning Policies (London Borough of Camden)

Camden Local Plan (2017)

The Camden Local Plan was adopted on 3 July 2017 and is the key strategic document in Camden's development plan. It sets out the vision for the shaping of the borough and contains policies for guiding planning decisions.

Camden Local Plan (2017) Policy CC1 Climate change mitigation

The Council will require all development to minimise the effects of climate change and encourage all developments to meet the highest feasible environmental standards that are financially viable during construction and occupation.

All developments are required to reduce carbon dioxide emissions through following the steps in the energy hierarchy and demonstrate how London Plan targets for carbon dioxide emissions have been met.

All major developments are required to assess the feasibility of connecting to an existing decentralised energy network, or where this is not possible establishing a new network.

To ensure that the Council can monitor the effectiveness of renewable and low carbon technologies, major developments will be required to install appropriate monitoring equipment.

Camden Local Plan (2017) Policy CC2 Adapting to climate change

All development should adopt appropriate climate change adaptation measures such as measures to reduce the impact of urban and dwelling overheating, including application of the cooling hierarchy.

Camden Planning Guidance: Energy efficiency and adaptation (2021)

This Camden Planning Guidance is consistent with the Local Plan and forms a Supplementary Planning Document (SPD) which is an additional "material consideration" in planning decisions. This SPD requires an energy statement to be produced for all developments involving 5 or more dwellings and/or more than 500sqm of any (gross internal) floor space.

4. Baseline Energy Demands and CO₂ Emissions

Introduction

The use classes for the Proposed Development include²:

- 139 residential units (totalling 12,871m² GIA)
- 305m² commercial space

Scope of Study

As noted in Section 1, the planning targets for the Proposed Development relate only to the *regulated* energy demands of the dwellings and the non-domestic units. Unregulated emissions have been calculated and the approach to minimising unregulated emissions is detailed within this Energy Statement.

Building Energy Modelling

Residential SAP Modelling

The Elmhurst Design SAP 2012 [version 4.14r16] software was used to model the energy demands of a representative sample of dwellings in Part L 2013. The modelling exercise provided the Target Emission Rate (TER) for each sample unit modelled as well as the projected demands for heating and hot water.

The representative sample models include:

- 24 units from Block A
- 24 units from Block B
- 26 units from Block C

Sample Design SAP 2012 model Dwelling Emission Rate (DER) and TER outputs worksheets for each of the sample units are provided in Appendix B.1.

The emissions for representative sample units have been used to calculate the overall baseline Part L 2013 regulated carbon emissions for all the dwellings on the site. The results of which can be seen in the GLA emission reporting spreadsheets within Appendix C.3.

Table 4-1 below details the total baseline carbon emissions for the dwellings.

Table 4-1. Total baseline dwelling regulated CO₂ emissions

	CO ₂ emissions, tCO ₂ / year	CO ₂ emission savings at stage of hierarchy, tCO ₂ / year
GLA Baseline (Part L 2013)	151.34	-

² Pollard Thomas Edward area schedule

Non-Domestic Modelling

Indicative Part L 2013 CO₂ emissions for the non-domestic elements of the Proposed Development have been calculated using the Part L approved software IES Virtual Environment version 7.0.13.

The table below shows the TER, Building Emission Rate (BER) and area for each non-domestic unit within the Proposed Development. The BRUKL worksheets for the non-domestic buildings are provided in Appendix B.2.

Table 4-2. Total baseline non-domestic regulated CO₂ emissions

	CO ₂ emissions, tCO ₂ / year	CO ₂ emission savings at stage of hierarchy, tCO ₂ / year
GLA Baseline (Part L 2013)	5.60	-

The carbon emissions associated with the non-domestic element of the development is relatively small and represents approximately 5% of the total development baseline CO₂ emissions.

Unregulated Energy Uses

For the purposes of responding to the Mayor of London's and LBC energy policies, the site total CO₂ emissions were calculated, including unregulated emissions not accounted for within SAP.

The unregulated emissions for dwellings have been calculated following the SAP 2012 technical guidance, based on the BREDEM methodology. The unregulated emissions for the non-domestic spaces have been estimated using IES Virtual Environment version 7.0.13.

Table 4-3. Total site baseline emissions

	Residential CO ₂ Emissions (tCO ₂ / year)	Non-domestic CO ₂ Emissions (tCO ₂ / year)
Unregulated Emissions	80.26	1.31

Energy Demand Split

The energy demand per year for both the residential and non-domestic buildings are reported in the following tables and graphs, the data has been taken from the 'Be Lean' models adopting the energy efficiency measures described in Section 6.

In summary, the data disaggregation shows that the residential regulated energy demand is dominated by heat demand. These differences have helped to inform where particular efforts should be concentrated to drive lower demand and fuel consumption.

Table 4-4. Residential annual energy demand split

	Space & DHW Heating (kWh/yr)	Lighting (kWh/yr)	Auxiliary Energy (kWh/yr)	Total Energy Demand (kWh/yr)
GLA Baseline	656,756	46,043	11,550	714,349
After efficiency measures	552,118	45,411	29,172	626,700

Table 4-5. Non-domestic annual energy demand split

	Space Heating (kWh/yr)	Domestic Hot Water (kWh/yr)	Lighting (kWh/yr)	Auxiliary Energy (kWh/yr)	Cooling (kWh/yr)	Total Energy Demand (kWh/yr)
GLA Baseline	5,308	517	14,971	1,236	3,043	25,075
After efficiency measures	3,706	545	10,370	2,117	1,965	18,704

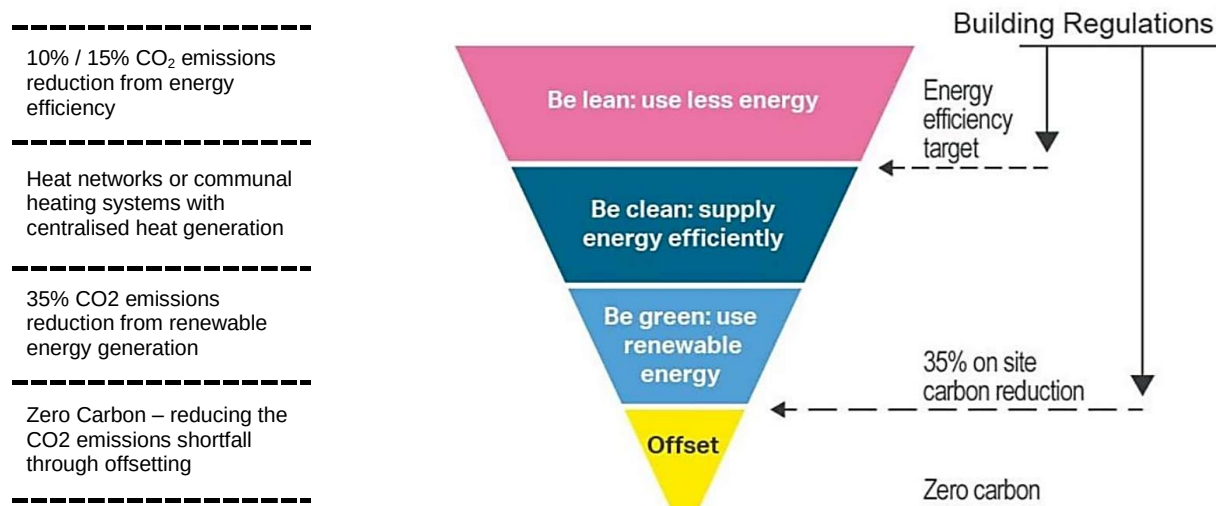
From the tables above, the Auxiliary Energy demand increases at the 'Be Lean' stage in comparison to the 'GLA Baseline'. This is due to the Part L calculation methodology using natural ventilation within the Part L 2013 Notional dwelling / TER calculation, this is the part used to create the GLA baseline. The Actual building / DER / Be Lean dwelling includes MVHR which has associated energy use which is not captured in the Notional building. It should be noted that as part of this MVHR energy usage, the MVHR system would also recover heat from extracted stale air to pre-heat the incoming fresh air and in turn reduce the space heating demand.

The energy demand analysis shows a reduction of 12% and 25% for the residential and non-domestic units respectively, through the incorporation of energy efficiency measures.

5. The Energy Hierarchy

The Proposed Development has been designed in accordance with the GLA Energy Hierarchy as described below in order to meet the carbon emissions reduction targets set both locally and regionally; going beyond Building Regulations.

Figure 5-1. Greater London Authority (GLA) London Plan regulated carbon emissions reduction priority hierarchy (GLA Energy Assessment Guidance, April 2020)



The following sections will outline how, at each stage of the Hierarchy, the Proposed Development meets these targets.

6. 'Be Lean': Energy Efficiency



A crucial requirement for any sustainable and low carbon development is to substantially reduce energy demand. The benefits are seen on multiple levels including improved comfort, lower operating costs and helping to maximise the potential for developments to be closer to energy self-sufficiency by balancing demand and renewable generation.

The following section details the measures proposed to deliver on the commitment to reduce energy demand and in doing so attain or exceed the carbon reduction targets set by the GLA for this stage in the energy hierarchy.

Dwellings

Fabric and Energy Efficiency Approach

Consideration has been given to the passive design, fabric and services of the buildings, including the following key measures:

- Orientation and layout of the dwellings;
- Localised shading to reduce overheating risks through the use of inset balconies;
- High performance U-values for the building fabric;
- Best practice thermal bridging (where possible);
- High level of air tightness;
- High efficiency lighting and ventilation systems including heat recovery; and
- Use of high-performance glazing.

Proposed Specifications

A high standard of fabric performance is proposed with the aim of exceeding Part L 2013 FEE requirement and targeting the 10% London Plan target using SAP10 Carbon Factors.

Table 6-1 shows the proposed fabric and energy efficiency specification for the dwellings, which will undergo further refinement as the design progresses.

Table 6-1. Indicative fabric and energy efficiency specification for residential units

Element	Units	Proposed Specification
Ground Floor	W/m ² K	0.10
Exposed Upper Floors / Soffits	W/m ² K	0.10
External Wall	W/m ² K	0.15
Corridor and Core (Lift Shaft et al) Wall	W/m ² K	0.25
Sheltered Wall	W/m ² K	0.20
Party Wall	W/m ² K	0.00
Roofs	W/m ² K	0.10
Windows	W/m ² K	1.20
Frame Factor	-	0.80

Element	Units	Proposed Specification
g-value	-	0.40
Air Permeability	m ³ /m ² .h @50Pa	3.00
Mechanical Ventilation with Heat Recovery (MVHR)	W/l/s %	SFP = 0.63 to 0.68 HR = 88% to 90%
Lighting	-	100% Low Energy Fittings
Thermal Mass Parameter	-	Medium

Table 6-2 shows the proposed thermal bridging values, which are good practice values based on previous developments.

Table 6-2. Thermal bridging value specification for dwellings

Junction Reference	SAP Description	Good practice Psi-Value Target
Junctions with External Wall		
E2	Other lintels (including other steel lintels)	0.15
E3	Sill	0.05
E4	Jamb	0.05
E5	Ground floor (normal)	0.16
E20	Exposed floor (normal)	0.32
E6	Intermediate floor within a dwelling	0.10
E7	Party floor between dwellings (block of flats)	0.10
E9	Balcony between dwellings, wall insulation continuous	0.40
E14	Flat roof	0.08
E16	Corner (normal)	0.05
E17	Corner (inverted)	-0.05
E18	Party wall between dwellings	0.05
Junctions with Party Wall		
P1	Ground floor	0.16
P2	Intermediate floor within a dwelling	0.00
P3	Intermediate floor between dwellings (block of flats)	0.00
P5	Roof (insulation at rafter level)	0.08
P7	Exposed floor (normal)	0.16

Dwelling Fabric Energy Efficiency (DFEE)

The DFEE is a Part L1A (2013) compliance assessment designed to compare the fabric thermal performance with that of the notional building. The benchmark known as the Target Fabric Energy Efficiency (TFEE). Therefore, the area weighted average of both must result in $DFEE \leq TFEE$. The specification has been set to exceed this requirement as demonstrated by the results in Table 6-3.

Table 6-3. Area weighted Fabric Energy Efficiency Standards (Residential Units)

Fabric Energy Efficiency (FEE) area weighted average (kWh/m²)	Residential Units
Target (TFEE)	41.75
Dwelling (DFEE)	36.97
Percentage difference	11.45%

Non-Domestic

Fabric and Energy Efficiency Approach

Consideration has been given to the passive design, fabric and services of the buildings, including the following key measures:

- Orientation and layout of the unit;
- High performance U-values for the building fabric; and
- Efficient lighting and HVAC systems.

Proposed Specifications

A high standard of fabric performance is proposed with the aim of exceeding Part L 2013 by energy efficiency measures alone.

Table 6-4 shows the proposed fabric and energy efficiency specifications for the non-domestic unit, which will undergo further refinement as the design progresses.

Table 6-4. Indicative fabric specification for non-domestic unit

Element	Units	Proposed Specification
Ground Floor	W/m ² K	0.10
Separating floor to residential units above	W/m ² K	0.10
External Wall	W/m ² K	0.15
Walls to Corridor and Core (Lift Shaft et al)	W/m ² K	0.25
Walls to Unheated Sheltered Spaces	W/m ² K	0.20
Roof	W/m ² K	0.10
Glazing	W/m ² K	1.30
Frame Factor	-	0.80
Light Transmittance	-	0.75
g-value	-	0.48
High-usage Entrance Doors	W/m ² K	1.30
Frame Factor	-	0.80
Light Transmittance	-	0.75
g-value	-	0.48
Louvre band above glazing	W/m ² K	1.30
Personnel Doors	W/m ² K	1.40
Air Permeability	m ³ /m ² .h @50Pa	3.00

Heating, Ventilation and Cooling

The non-domestic spaces are being supplied as shell and core units. Specification and design of heating, cooling and ventilation systems is beyond the scope of this report. Inputs for the models have been assumed and are summarised in Table 6-5. The GLA requires the Baseline/Lean case model uses natural gas as the heating and DHW source.

Table 6-5. Indicative energy efficiency specification for non-domestic unit

Item	Baseline/Lean value
HVAC Systems	
NCM system type:	Fan coil systems
Heating source	Natural gas
Generator seasonal efficiency	91%
Delivery efficiency (%)	100
SCoP:	0.91
Heat recovery (%)	80
Cooling source	ASHP
Cooling system SEER	5.5
Cooling system heat rejection power (% of rejected heat)	0 included in overall value
Cooling system delivery efficiency (%)	100
Cooling system SSEER (including heat rejection)	5.5
Specific fan power (W/l/s)	1.2
Auxiliary pump type:	Variable speed multiple pressure sensor
Terminal unit SFP (W/l/s)	0.2
Demand control vent	None
Domestic Hot Water	
System source	Natural gas
Generator seasonal efficiency	91%
DHW delivery efficiency	90%
NCM system type:	Fan coil systems

Lighting

A high efficiency lighting design is proposed with an appropriate control strategy. A lighting efficacy of 100 lm/W is proposed across all non-domestic areas, it is assumed that the spaces will be lit to the NCM lux levels.

‘Be Lean’ Results Summary

The current approach follows the policy guidance by implementing passive efficiency measures to reduce the space heating and domestic hot water demands. The results currently show an estimated reduction in CO₂ emissions of 18.02 tonnes/CO₂/year for the residential units and 1.42 tonnes/CO₂/year for the non-domestic units.

These reductions equate to an **11.90%** ‘Be Lean’ CO₂ emission saving for the residential units; and a **25.38%** ‘Be Lean’ CO₂ mission saving for the non-domestic units.38%. These carbon emission reductions accord with the London Plan Policy SI2 “Minimising greenhouse gas emissions” which has targets of a 10% reduction for residential units an 15% for non-domestic units.

When extrapolated across the whole site, which is equivalent to a 12.38% reduction in regulated carbon emissions against the SAP10 carbon emission factors, as shown in Table 6-8.

Table 6-6. Residential carbon savings following the 'Be Lean' reduction measures

	CO ₂ emissions, tCO ₂ / year	CO ₂ emission savings at stage of hierarchy, tCO ₂ / year
GLA Baseline (Part L 2013)	151.34	-
After 'Be Lean'	133.32	18.02 (11.90%)

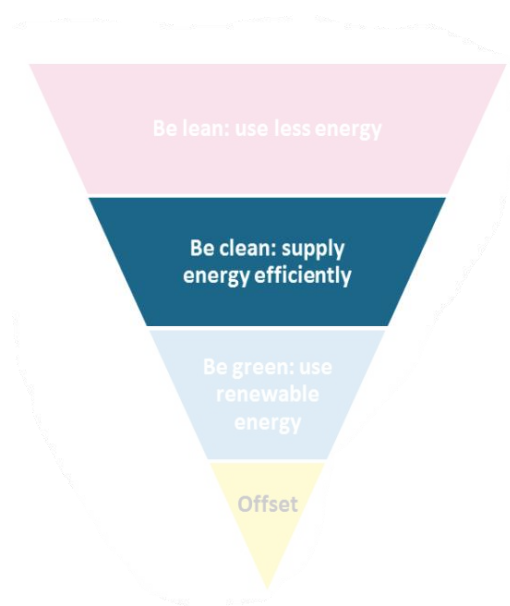
Table 6-7. Non-Domestic carbon savings following the 'Be Lean' reduction measures

	CO ₂ emissions, tCO ₂ / year	CO ₂ emission savings at stage of hierarchy, tCO ₂ / year
GLA Baseline (Part L 2013)	5.60	
After 'Be Lean'	4.18	1.42 (25.38%)

Table 6-8. Site-wide carbon savings following the 'Be Lean' reduction measures

	CO ₂ emissions, tCO ₂ / year	CO ₂ emission savings at stage of hierarchy, tCO ₂ / year
GLA Baseline (Part L 2013)	156.93	
After 'Be Lean'	137.50	19.44 (12.38%)

7. 'Be Clean': Decentralised Energy



Having minimised energy demand, it is important to supply energy efficiently such that the primary energy needed is also minimised. To realise this ambition across London, developments need to promote heating solutions that support decentralised energy generation. This strategy will mean developments can now, or in the near future, readily integrate into district wide initiatives to distribute low carbon and affordable heat.

This section assesses opportunities to reduce carbon emissions using decentralised energy generation such as connection to district networks. Where this is not possible, the development will be future-proofed for later integration.

Policy SI 3 of the London Plan states that major development proposals within Heat Network Priority Areas should have communal heating systems and the heat source for the communal heating system should be selected in accordance with the following heating hierarchy:

1. Connect to local existing or planned heat networks
2. Use zero-emission or local secondary heat sources (in conjunction with heat pump, if required)
3. Use low-emission combined heat and power (CHP) (only where there is a case for CHP to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network)
4. Use ultra-low NOx gas boilers

Local Heat Network Appraisal

Once demand for energy has been reduced the next thing to consider for the Proposed Development is to supply energy via heat networks. The London Heat Map was consulted on 28th March 2020, the findings are broken into four separate categories: existing networks; proposed networks; opportunity to create network via local developments; and opportunities to create network via local sources of heat demand. A summary of the study is contained in Table 7-1.

Table 7-1. Heat Network Appraisal Summary

	Location	Walking Distance from Site	Source of Information	Type of Equipment	Notes	Action Taken
Existing Networks	Church Street, City of Westminster	c.1,900m	GLA Heat Map BEIS Heat Network Pipeline (2019 Q2)	Mains Gas CHP	The Church Street network is approximately 2km from the site, due to the large distance, connection options have not been explored any further.	N/A

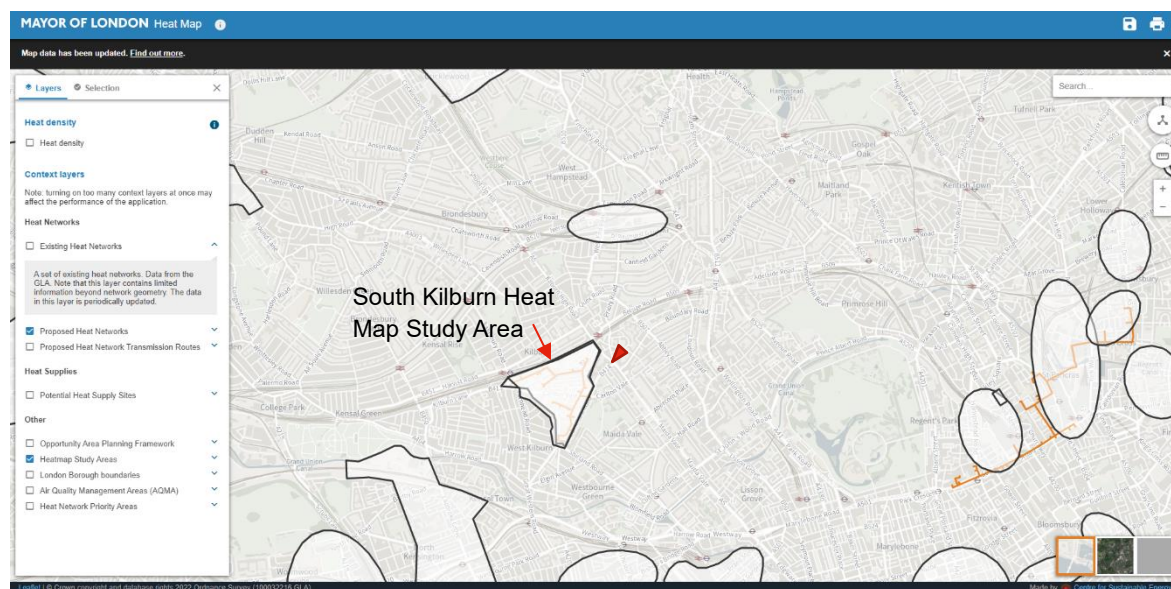
	South Kilburn Heat Network, City of Westminster	c.670m	GLA Heat Map Rehva CHP Presentation	Mains Gas CHP	According to Rehva, the South Kilburn Heat network serves approximately 2,400 dwellings via a 2.5 MWth / 1.5 MWe CHP unit. Whilst the network is located within relatively close proximity to the proposed development, the route of the pipework would have to cross a train line.	Contacted 24 January 2022 @ 17:26 to ask if the network has space capacity and to request connection viability information. Discussions ongoing.
Proposed Networks	Euston Road, London Borough of Camden	c.3,500m	GLA Heat Map BEIS Heat Network Planning Database	Mains Gas CHP	The Euston Road heat network has been deemed too far to provide a viable connection.	N/A
	Wood Lane, Hammersmith & Fulham	c.3,500m	GLA Heat Map BEIS Heat Network Planning Database	Mains Gas CHP	The Wood Lane heat network has been deemed too far to provide a viable connection.	N/A
Opportunities to Create District Heat Network (Local Developments)	254 Kilburn High Road London NW6 2BS	c.950m	Planning Application Ref: 2020/1185	Unknown	Mixed-use development, however the planning application was withdrawn. Due to the site being approximately 1km away from ARP3, no further actions have been undertaken.	N/A
	Canterbury Terrace, London NW6 5DY	c.800m	Planning Application Ref: 19/3259	Mains Gas CHP	Large scale mixed use development, proposals include connection to the South Kilburn Heat Network.	As above, we have contacted the South Kilburn Network operators.
	156 West End Lane, London NW6 1SD	c.950m	Planning Application Ref: 2015/6455	Mains Gas CHP	Large scale mixed use development, proposals include on site CHP system connected to site wide heat network. We understand the CHP has been designed for the size of the development. Due to the site being approximately 1km away from ARP3, no further actions have been undertaken.	N/A
	Durham Court and Garages, Kilburn Park Road, London, NW6 & Gloucester House and Garages, Cambridge Road, London, NW6	c.950m	Planning Application Ref: 14/1896	Mains Gas CHP	Large scale mixed use development, proposals include connection to the South Kilburn Heat Network.	As above, we have contacted the South Kilburn Network operators.

	Tollgate Gardens Estate Oxford Road London NW6 5SN	c.500m	Planning Application Ref: 13/05695/COFUL	Mains Gas CHP	Large scale mixed use development, proposals include on site CHP system connected to site wide heat network. Based on the Energy Statement submitted as part of the planning application, we understand the CHP has been designed for the size of the development.	N/A
Opportunities to Create District Heat Network (Local areas of Heat Demand)	Harris Academy, Marlborough Hill, London NW8 0NL	c.900m	GLA Heat Map	Unknown	The distance does not make this viable.	N/A
	Swiss Cottage Leisure Centre, Adelaide Rd, London NW3 3NF	c.1150m	GLA Heat Map	Unknown	The distance does not make this viable.	N/A
	Plaza Parade North Maida Vale, London NW6 5RP	c.600m	GLA Heat Map	Unknown	The distance does not make this viable.	N/A
	Ruach City Church, 197-199 KILBURN HIGH ROAD LONDON	c.800m	GLA Heat Map	Unknown	The distance does not make this viable.	N/A

Heat Network Summary

The site benefits from being located c. 670m from the South Kilburn Heat Network, which serves 2,400 dwellings via a 2.5 MWth / 1.5 MWe CHP unit. The operator has been contacted to enquire about the network capacity and to request connection viability information. However, there are several barriers to connection. The route of the pipework would have to cross a rail line and the proposed development is outside of the South Kilburn Heat Map Study Area as shown in Figure 7-1.

Figure 7-1. Heat map showing the Proposed Development and the South Kilburn Heat Map Study Area



There are no other existing or proposed District Heat Networks within a suitable proximity to the Proposed Development and there are no local developments that are suitable for the creation of a Heat Network. Therefore, connection to a heat network is deemed unfeasible at this stage.

In any event, the development will incorporate the provision of spatial allowances and fittings to facilitate potential future connection to a local District Heating system.

Consideration will be given to include an allowance for incoming pipework connections via an accessible trench. Adequate provisions will also be made in the plant room design to allow a potential future changeover from a site-wide heating system to District Heating Network connection as the primary heating source. If this option is selected, the changeover will likely occur whilst the proposed development is in occupation therefore a strategy should be in place to minimise the impact to occupiers whilst allowing minimal remedial works. This approach follows London Plan Policy SI2 "Minimising greenhouse gas emissions" and SI3 "Energy Infrastructure".

‘Be Clean’ Results Summary

A summary of the ‘Be Clean’ measures are listed below:

- The development will be built with a communal heat network and central heat generation. A low temperature hot water loop, with centralised heat sources will distribute heat across all blocks within Abbey Road Phase 3. This will facilitate greater viability for future heat network connections compared to dedicated building or dwelling level heating systems.
- Attention will be paid to the specification of the communal networks to drive energy efficiency including selecting suitable operating temperatures and minimising distribution losses. A low temperature loop is designed to address this issue and maintain high efficiencies for the site-wide heating system.
- A potential future connection to a local District Heating system will be addressed through the provision of spatial allowances and fittings to facilitate potential future connection.

This approach follows London Plan Policy SI2 “Minimising greenhouse gas emissions” and SI3 “Energy Infrastructure”.

Table 7-2. Residential carbon savings following the 'Be Clean' reduction measures

	CO ₂ emissions, tCO ₂ / year	CO ₂ emission savings at stage of hierarchy, tCO ₂ / year
After 'Be Lean'	133.32	-
After 'Be Clean'	133.32	0.00 (0.00%)

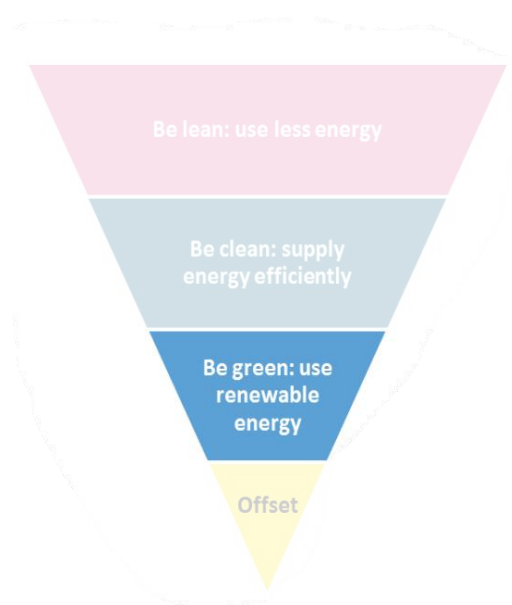
Table 7-3. Non-Domestic carbon savings following the 'Be Clean' reduction measures

	CO ₂ emissions, tCO ₂ / year	CO ₂ emission savings at stage of hierarchy, tCO ₂ / year
After 'Be Lean'	4.18	
After 'Be Clean'	4.18	0.00 (0.00%)

Table 7-4. Site-wide carbon savings following the 'Be Clean' reduction measures

	CO ₂ emissions, tCO ₂ / year	CO ₂ emission savings at stage of hierarchy, tCO ₂ / year
After 'Be Lean'	137.50	
After 'Be Clean'	137.50	0.00 (0.00%)

8. 'Be Green': Renewable Energy



The aspiration of a zero carbon London will require energy generated locally to minimise the pressure on the national infrastructure and lessen the power needed from fossil fuel generators. The policy requirement is therefore to maximise renewable energy generation on-site.

The following section appraises a range of renewable technologies that could be adopted for the Proposed Development. It details which measures are taken forward and proposed so that the development can deliver on the 'Be Green' policy.

Options Appraisal

The following options for delivering renewable energy generation on-site were considered, in line with the London Plan requirements:

- Solar water heating;
- Heat pumps;
- Wind turbines;
- Photovoltaics (PV); and
- Biomass heating.

The potential application of each technology has been assessed based on the opportunities and constraints proposed by the Proposed Development.

Table 8-1. Renewable Energy Generation / Offset Options

Technology	Renewable Energy Generated / Offset		
	Electricity	Hot Water	Space Heating
Photovoltaics	✓		
Heat pumps		✓	✓
Wind turbines	✓		
Solar water heating		✓	
Biomass		✓	✓

Photovoltaics

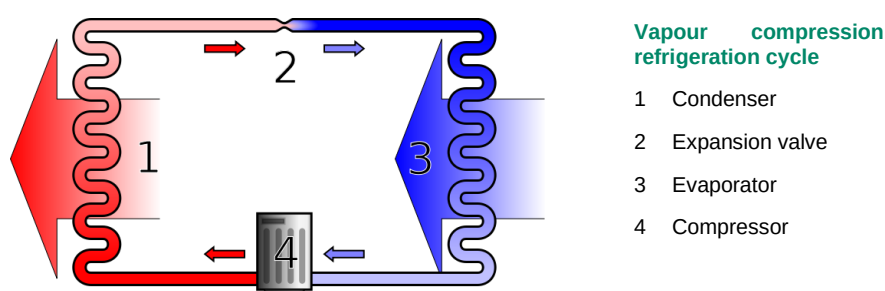
Photovoltaic (PV) panels work by using the sun's energy to create electricity. PV panels contain cells which are made up from layers of semi-conducting material such as silicone. When the sunlight hits the cell, an electric field is created across the layers which are then passed through an inverter that converts the electrical current from Direct Current to Alternating Current, ready for use within a building. Solar panels are relatively straightforward to install, providing visual commitment to reducing energy use and CO₂ emissions.

Heat Pumps

Electric heat pumps offer an efficient method for generating heat from electricity by benefiting from the vapour compression refrigeration cycle as illustrated in Figure 8-1.

Heat pumps are considered a renewable technology as they convert energy in the environment [3] in the form of relatively low source temperatures to usable heat output [1] that depending on the specification can provide both heating and hot water. The compressor [4] draws electricity in order to do this.

Figure 8-1. Heat pump process diagram (Source: Ilmari Karonen, available for use without conditions)



The available source at the site is air where fans are used to increase the flow rate over the environment [3] heat exchanger to enable the design load output [1] to be met.

Wind Turbines

Based on the impact of wind energy generation to residents in the surrounding area and the relatively low and disrupted wind speeds typically found in built-up areas, wind power will not be considered further for the Proposed Development.

Solar Water Heating (SHW)

Solar hot water systems use energy from the sun to warm water for storage in a hot water cylinder or thermal store.

Solar hot water systems are not typically feasible for large scale developments due to the distribution losses that would be seen as the hot water goes from the roof to the apartments. SHW would not be able to meet the full hot water and heating demand of the development and therefore another system would be required. Additionally, the preferred utilisation for the available roof space is solar PV as the heat pumps are capable of meeting the development heating and hot water demand. Therefore, SHW systems will not be considered further.

Biomass

When used with a sustainably managed fuel source, biomass is classed as a carbon neutral fuel, as the CO₂ produced in generating energy is absorbed by the plants that are the source of the fuel during their growth.

The development should minimise the local emissions generated by the development to not impact negatively on the local air quality. Biomass heat relies on the combustion of organic material resulting in high levels of emissions containing particulate matter (PM), nitrogen oxides (NO_x), carbon monoxide (CO), sulphur dioxide (SO₂), and other hazardous air pollutants (HAPs). Therefore, Biomass will not be considered further.

Proposed Renewable Technologies

Photovoltaics

The Proposed Development will incorporate roof mounted PVs on all areas that are not to be utilised for roof mounted plant, roof top amenity or are significantly overshadowed. PV panels on green roofs will be mounted using a system such as the ERG Solar Nature Scheme displayed in Figure 8-2, whereas PV on ballast roofs will be mounted using a flat roof system such as the S-Dome System displayed in Figure 8-3.

Figure 8-2. Eco Green Roofs – Solar Nature Scheme PV roof mounting system for green roofs

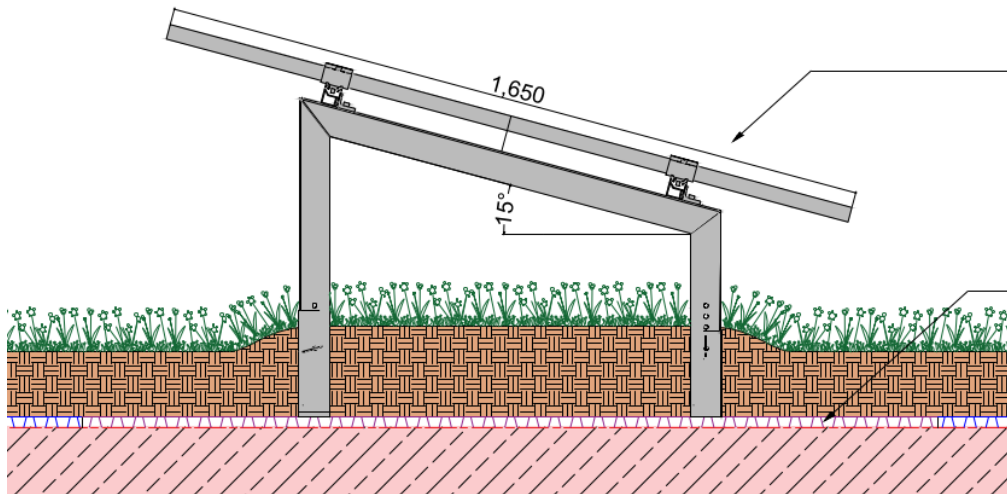


Figure 8-3. K2 Systems – S-Dome System PV roof mounting system for ballast roof



A summary of the estimated PV array performance is outlined in Table 8-2.

Table 8-2. PV proposals

Information Summary	Block A	Block B	Block C
No. Panels	61	50	52
Rated Panel Output (kWp)	0.35	0.35	0.35
Total kWp	21.35	17.50	18.20
Estimated KWh annual generation	16,243	13,314	14,982

Heat Pumps

In addition to incorporating Photovoltaic technology, heat pump technology is currently proposed to provide space heating and domestic hot water for the Proposed Development. The proposal is to utilise renewable heat with electric air source heat pumps (ASHPs) centrally with electric top-up boilers, this in turn will feed a site-wide low temperature hot water loop.

A summary of the heat pump performance specification for the residential units is contained in Table 8-3.

Table 8-3. Indicative energy efficiency specification for Residential Units³

Item	'Green' value
Heat Source 1	Air Source Heat Pump
Heating Fuel	Mains Electric
SCOP	2.50
Heat Demand %	95%
Heat Source 2	Boiler
Heating Fuel	Mains Electric
Efficiency	99%
Heat Demand %	5%
Network Distribution Loss	15% network losses Factor: 1.18

³ Norman Bromley, Email correspondence: temporary SCOP of 2.5 01/04/2022 @ 12:38

The flexible commercial units will be developed as a shell and core unit with fit-out undertaken by the tenant. Options to allow the tenant to install localised ASHP/VRF systems would suit the flexible space and enable the future tenants to install a suitable system to suit the fit-out requirements. Specification and design of heating, cooling and ventilation systems is beyond the scope of this report. Inputs for the models have been assumed and are summarised in Table 8-4.

Table 8-4. Indicative energy efficiency specification for non-domestic units

Item	'Green' value
HVAC Systems	
NCM system type:	Fan coil systems
Heating source	ASHP
Generator seasonal efficiency	4.5
Delivery efficiency (%)	100
SCoP:	4.5
Heat recovery (%)	80
Cooling source	ASHP
Cooling system SEER	5.5
Cooling system heat rejection power (% of rejected heat)	0 included in overall value
Cooling system delivery efficiency (%)	100
Cooling system SSEER (including heat rejection)	5.5
Specific fan power (W/l/s)	1.00
Auxiliary pump type:	Variable speed multiple pressure sensor
Terminal unit SFP (W/l/s)	0.2
Demand control vent	None
Domestic Hot Water	
System source	Electric Point of Use
Generator seasonal efficiency	1.0
DHW delivery efficiency	95%

'Be Green' Results Summary

A summary of the 'Be Green' measures are listed below:

- The communal network's heat will minimise on-site fossil fuel combustion in favour of heat from electric heat pumps. All of the heat from the central energy centre will be produced by systems that use electricity and embraces the National (electrical) Grid decarbonisation programme. This strategy will also help with local air quality considerations when compared with systems that rely on fossil fuel combustion.
- The system of centralised air source heat pumps (ASHPs) with electric top-up boilers will deliver low carbon heat with minimal impact to local air quality when compared with systems that rely on fossil fuel combustion.
- The non-domestic units are provided with the option to allow the tenant to install localised Air Source Heat Pump (ASHP) / Variable Refrigerant Flow (VRF) systems; this suits the flexible space and will enable the future tenants to install a suitable system to meet the fit-out requirements.
- On-site renewable energy generation will be maximised by utilising the available flat roof space to incorporate solar PV panels into the design.

Table 8-5, Table 8-6 and Table 8-7 outline the CO₂ emissions and resulting savings after the 'Be Lean/Be Clean' measures for the 'Be Green' element of the hierarchy in line with London Plan Policy S12 "Minimising greenhouse gas emissions". The results demonstrate that the 35% target reduction can be exceeded by combining all the proposed on-site reduction measures.

Table 8-5. Residential carbon savings following the 'Be Green' reduction measures

	CO ₂ emissions, tCO ₂ / year	CO ₂ emission savings at stage of hierarchy, tCO ₂ / year
After 'Be Clean'	133.32	-
After 'Be Green'	61.26	72.06 (54.05%)

Table 8-6. Non-Domestic carbon savings following the 'Be Green' reduction measures

	CO ₂ emissions, tCO ₂ / year	CO ₂ emission savings at stage of hierarchy, tCO ₂ / year
After 'Be Clean'	4.18	
After 'Be Green'	3.38	0.80 (19.06%)

Table 8-7. Site-wide carbon savings following the 'Be Green' reduction measures

	CO ₂ emissions, tCO ₂ / year	CO ₂ emission savings at stage of hierarchy, tCO ₂ / year
After 'Be Clean'	137.50	
After 'Be Green'	64.64	72.86 (52.99%)

9. 'Be Seen' & Benchmarking

A suitable metering strategy will be developed during the technical design stage to record energy consumption upon first occupation of the development and eventually including all the buildings.

The developer is committed to monitoring and reporting its energy performance post-construction to understand the actual carbon performance of the development.

As described in the GLA's Energy Assessment Guidance (April 2020) the energy performance data will be submitted annually to the GLA for each reportable unit for at least 5 years. This development will follow guidance set out in the Be Seen Guidance (September 2021).

The estimated energy demands for both regulated and unregulated energy have been calculated as part of the Whole Life-cycle Carbon assessment. The estimated regulated energy demand from the residential units has been derived from the Standard Assessment Procedure (SAP) and estimated unregulated residential energy using the BREDEM methodology. The estimates for both regulated and unregulated energy demands for the non-domestic units has been derived from the Simplified Building Energy Model (SBEM) / National Compliance Methodology (NCM).

Table 9-1. Energy Demand Summary

Energy Demand Source	Estimated Energy Demand (kWh/yr)
Residential Regulated (Electric)	626,700
Residential Unregulated	344,473
Non-domestic Regulated (Electric)	14,507
Non-domestic Unregulated (Electric)	5,621

As the design develops more certainty can be gained and the estimates can be revisited and revised ahead of occupation. The non-domestic areas will require further engagement with the end occupier once they're able to better determine the intended use and likely usage profile. Once this possible it may be of value to update the energy estimates with a detailed model.

10. Offset Payments

The London Plan 2021 Policy SI2 requires that new domestic and non-domestic developments meet a minimum 35% on-site carbon emission reduction against Part L 2013 and that any residual emissions should be offset to zero. The policy states that where these targets cannot be met on-site, the short fall should be met off-site, or a payment should be made into the Council's carbon offset fund. Table 14-1 below outlines the carbon emissions to be offset to meet the zero-carbon buildings target for the Proposed Development, based on the Part L modelling undertaken.

Table 10-1. Carbon Emissions to be Offset

	Residential	Non-domestic	Total
On-site reduction target (%)	100%	100%	100%
Overall predicted on-site reduction (%)	59.52%	39.60%	Tbc
Residual emissions to meet target (t/CO ₂ /year)	61.26	3.38	64.64
Residual emissions over 30 years(t/CO ₂)	1,837.8	101.4	1,939.20
Estimated Carbon Offsetting Price at £95 per tonne	£174,591	£9,633	£184,224

The proposed carbon offset price will be discussed and agreed between the applicant and LBC via separate discussion. It is understood the details of the offset payment will be finalised within the Section 106 agreement.

11. Conclusion

Carbon Emissions Targets

To estimate the total energy demand and Part L 2013 CO₂ emissions for the new housing, Design SAP 2012 software was used to calculate the regulated energy demands, and Standard Assessment Procedure (SAP) 2012 guidance was used to calculate the unregulated energy demands. For the non-domestic units approved Part L software IES version 2019 was used to estimate the Part L 2013 regulated and unregulated energy demands and CO₂ emissions.

Each category of CO₂ emission saving strategy is aligned to the London Plan energy hierarchy. The Plan sets a target of zero-carbon for the development with the following minimum on-site reductions:

- Carbon emission reduction of 10% for new dwellings from energy efficiency measures ('Be Lean')
- Carbon emission reduction of 15% for new non-dwellings from energy efficiency measures ('Be Lean')
- Total combined saving of 35% for all on-site carbon reduction measures including 'Be Lean', 'Be Clean' and 'Be Green'

The difference between the total on-site emissions reduction and regulated zero-carbon has been reported.

Carbon Emissions Reduction

The current proposals incorporate high performance glazing and u-values for the building fabric, high level of air tightness to reduce drafts and reduce heat movement, reduction of thermal bridging where possible and the incorporation of localised shading to reduce overheating risks. Highly efficient core building services such as Mechanical Ventilation with Heat Recovery, have been selected.

The current approach follows the policy guidance by implementing passive efficiency measures to reduce the space heating and domestic hot water demands. The 'Be Lean' results currently show an estimated reduction in CO₂ emissions of 18.02 tonnes/CO₂/year for the residential units and 1.42 tonnes/CO₂/year for the non-domestic units, which is equivalent to a **11.90%** and **25.38%** reduction in regulated carbon emissions against the GLA Baseline respectively.

This strategy has been designed to meet the London Plan targets of zero-carbon buildings, with a minimum on-site 35% reduction in regulated CO₂ emissions, for developments. The on-site target has been exceeded by 23.81% and reports a combined reduction of **58.81%**. These reductions are measured against the Part L 2013 baseline using SAP10 fuel factors and shown in Figure 11-1 and Figure 11-2.

A brief description of the strategy at each energy hierarchy stage is summarised below.

Be Lean	• A fabric first approach has been adopted to reduce energy demand and the Dwelling Fabric Energy Efficiency (DFEE) is less than the Target Fabric Energy Efficiency (TFEE) Part L 2013 target. • The building services will include energy efficient lights, optimised heat distribution and mechanical ventilation with heat recovery. • The domestic units are currently showing a Be Lean CO₂ emission saving of 11.90%. • The non-domestic units are currently showing a Be Lean CO₂ emissions saving of 25.38%.
Be Clean	• The development will be built with a communal heat network and central heat generation. A low temperature hot water loop, with centralised heat sources will distribute heat across all blocks within Abbey Road Phase 3. This will facilitate greater viability for future heat network connections compared to dedicated building or dwelling level heating systems. • Attention will be paid to the specification of the communal network to drive energy efficiency including selecting suitable operating temperatures and minimising distribution losses.

	• Opportunities to connect into an existing District Heat Network is currently being investigated. A future connection to a local District Heating system will be addressed through the provision of spatial allowances and fittings to facilitate potential future connection.
Be Green	• The communal network's heat will minimise on-site fossil fuel combustion in favour of heat from electric heat pumps. All of the heat from the central energy centre will be produced by systems that use electricity and embraces the National (electrical) Grid decarbonisation programme. This strategy will also help with local air quality considerations when compared with systems that rely on fossil fuel combustion. • The system of centralised air source heat pumps (ASHPs) with electric top-up boilers will deliver low carbon heat with minimal impact to local air quality when compared with systems that rely on fossil fuel combustion. • The non-domestic units are provided with the option to allow the tenant to install localised Air Source Heat Pump (ASHP) / Variable Refrigerant Flow (VRF) systems; this suits the flexible space and will enable the future tenants to install a suitable system to meet the fit-out requirements. • On-site renewable energy generation will be maximised by utilising the available flat roof space to incorporate solar PV panels into the design. • Total on-site carbon reduction is currently targeting a 58.81% saving, exceeding the policy minimum of 35% saving.
Offset	• There is a shortfall to achieving the target of zero regulated carbon emissions, which will be offset in accordance with LBC and GLA requirements. • The residential shortfall is estimated to be 61.26 tonnes/CO₂/year. At a rate of £95/tonneCO₂ over 30 years this results in an offsetting payment of £174,591. • The non-domestic shortfall is estimated to be 3.38 tonnes/CO₂/year. At a rate of £95/tonneCO₂ over 30 years this results in an offsetting payment of £9,633.
Be Seen	• A suitable metering strategy will be developed to record energy consumption. • The developer or ongoing management company will be required to monitor and report the energy consumption and generation as required by the GLA and documented in the recently published draft 'Be Seen' energy monitoring guidance (April 2020)

This strategy has been designed to meet the London Plan targets of zero-carbon buildings, with a minimum on-site 35% reduction in regulated CO₂ emissions, for developments. The on-site target has been exceeded and reports a combined reduction of **58.81%**.

Table 11-1. Residential: CO₂ Emissions Summary

	Annual CO ₂ (tCO ₂ /year)	Regulated Emissions, (tCO ₂ /year)	Annual CO ₂ Reduction, (tCO ₂ /year)	Regulated Emissions % Saving	Annual CO ₂ (tCO ₂ /year)	Unregulated Emissions, (tCO ₂ /year)
Baseline Part L 2013 compliance	151.34	-	-	-	80.26	
After 'Be Lean'	133.32	18.02		11.90%	80.26	
After 'Be Clean'	133.32	0.00		0.00%	80.26	
After 'Be Green'	61.26	72.06		54.05%	80.26	
Total Cumulative Savings		90.08		59.52%		
Zero-Carbon shortfall	61.26					

Table 11-2. Non-Domestic CO₂ Emissions Summary

	Annual Regulated CO ₂ Emissions, (tCO ₂ /year)	Annual Regulated CO ₂ Emissions Reduction, (tCO ₂ /year)	% Saving	Annual Unregulated CO ₂ Emissions, (tCO ₂ /year)
Baseline Part L 2013 compliance	5.60	-	-	1.31
After 'Be Lean'	4.18	1.42	25.38%	1.31
After 'Be Clean'	4.18	0.00	0.00%	1.31
After 'Be Green'	3.38	0.80	19.06%	1.31
Total Cumulative Savings		2.22	39.60%	
Zero-Carbon shortfall				

Table 11-3. Sitewide CO₂ Emissions Summary

	Annual Emissions, (tCO ₂ /year)	Regulated CO ₂ Reduction, (tCO ₂ /year)	Annual Regulated Emissions, (tCO ₂ /year)	% Saving	Annual Unregulated CO ₂ Emissions, (tCO ₂ /year)
Baseline Part L 2013 compliance	156.93	-	-	-	85.88
After 'Be Lean'	137.50	19.44	12.38%	85.88	
After 'Be Clean'	137.50	0.00	0.00%	85.88	
After 'Be Green'	64.64	72.86	52.99%	85.88	
Total Cumulative on-site savings		92.29	58.81%		

Residual emissions over 30 years(t/CO₂)

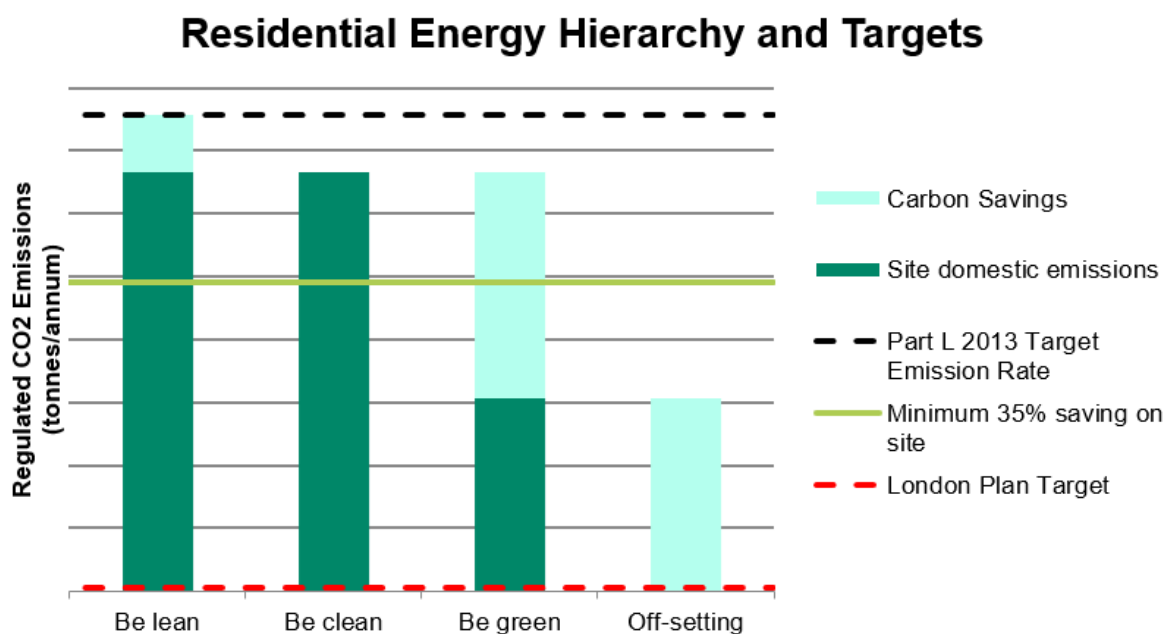
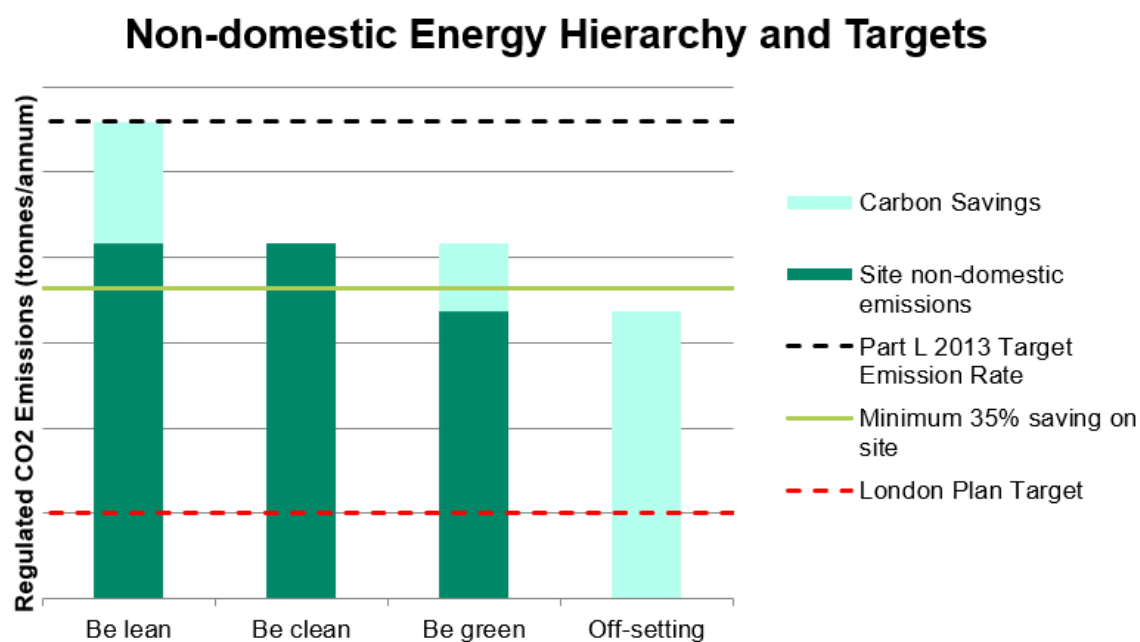
Figure 11-1. Domestic regulated CO₂ emissions reductions at each step of the Energy Hierarchy

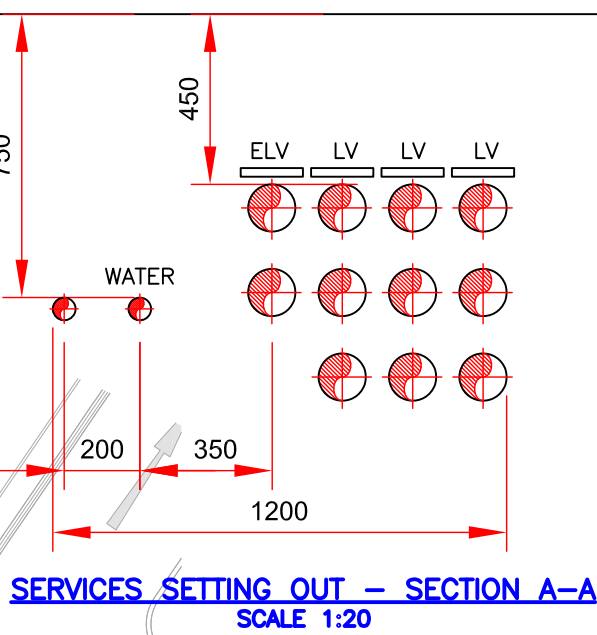
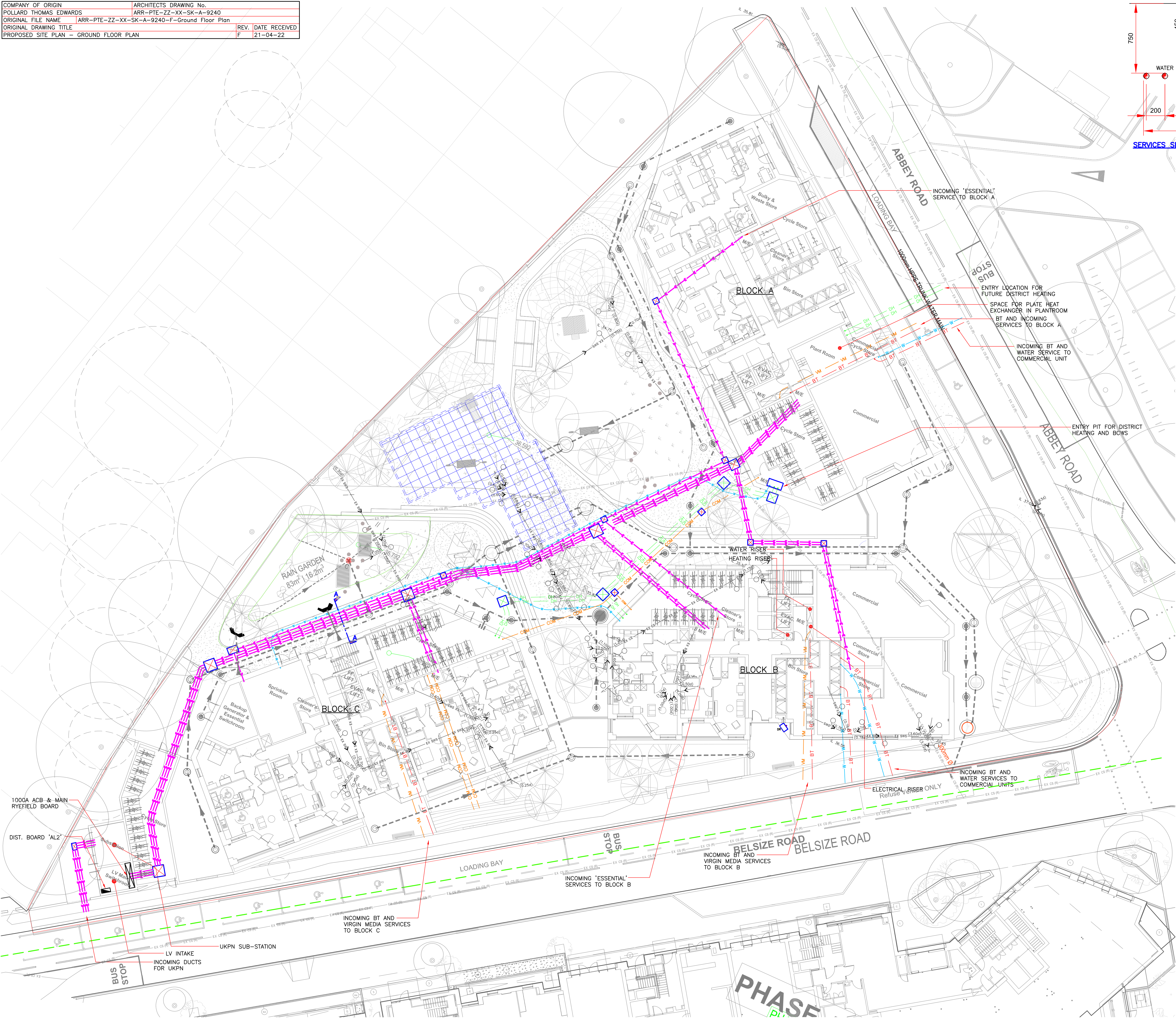
Figure 11-2. Non-Domestic regulated CO₂ emissions reductions at each step of the Energy Hierarchy



Appendix A Decentralised Energy

A.1 Space allocation and route to boundary drawing and example schematic

COMPANY OF ORIGIN	ARCHITECTS DRAWING No.
POLLARD THOMAS EDWARDS	ARR-PTE-ZZ-XX-SK-A-9240
ORIGINAL FILE NAME	ARR-PTE-ZZ-XX-SK-A-9240-F-Ground Floor Plan
ORIGINAL DRAWING TITLE	REV. DATE RECEIVED
PROPOSED SITE PLAN - GROUND FLOOR PLAN	F 21-04-22



Notes			
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE INDICATED.			
2. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE SPECIFICATION AND ALL OTHER DRAWINGS.			
LEGEND			
BT	—	BELOW GROUND BT SERVICE	
E	—	BELOW GROUND UKPN ELECTRICAL SERVICE	
DH	—	DISTRICT HEATING	
VM	—	VIRGIN CABLE	
W	—	BELOW GROUND WATER SERVICE	
COM	—	COMMS	
02	28.04.22	BLOCK A REVISED/ FUTURE DISTRICT HEATING SHOWN.	DP MR
01	28.03.22	TENDER ISSUE	DP MR
Rev	Date	Notes	Dwn Chk
 NORMAN BROMLEY PARTNERSHIP			
Consulting Engineers			
Bridge House, 97-101 High Street, Tonbridge, Kent. TN9 1DR			
Tel. No. (01732) 773737 Fax No. (01732) 773353 Email: mail@normanbromley.co.uk			
Client			
WATES			
Project			
ABBNEY ROAD - PHASE 3			
Service			
Mechanical & Electrical Engineering			
Title			
SITE PLAN MECHANICAL AND ELECTRICAL SERVICES			
Scale	Date	Drawn	Approved
1:200@A1	FEB'22	DP	MR
Drawing No.	Rev.		
ABB-NBP-XX-00-GA-ME-65-451	02		

Appendix B Regulated Energy Assessment Outputs

B.1 Sample SAP 2012 model DER & TER worksheets (dwellings)

GLA Baseline & 'Be Lean' Case SAP Worksheets

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	001	Issued on Date	29/04/2022
Assessment Reference	001	Prop Type Ref	
Property			
SAP Rating	84 B	DER	15.88
Environmental	86 B	TER	17.18
CO ₂ Emissions (t/year)	1.55	% DER<TER	7.59
General Requirements Compliance	Pass	DFEE	49.74
		TFEE	59.07
		% DFEE<TFEE	15.80
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Ground-floor flat, total floor area 121 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Mains gas (c)
Fuel factor: 1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.18 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.88 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 59.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 49.7 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK

Based on:

Overshading: Average
Windows facing North East: 5.45 m², No overhang
Windows facing South West: 3.69 m², No overhang
Windows facing West: 6.48 m², No overhang
Windows facing North West: 7.65 m², No overhang
Air change rate: 3.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Floor U-value 0.10 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	121.4200 (1b)	x 2.8000 (2b)	= 339.9760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	121.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 339.9760 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												75.6500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			23.2700	1.1450	26.6450		(27)
Ground Floor			121.4200	0.1000	12.1420		(28a)
External Wall	83.2400	23.2700	59.9700	0.1500	8.9955		(29a)
Corridor	15.2900	1.8900	13.4000	0.2500	3.3500		(29a)
Unheated	29.0100		29.0100	0.2000	5.8020		(29a)
Total net area of external elements Aum(A, m ²)			248.9600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		58.8245		(33)
Party Wall 1			14.4500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							17.7556 (36)
Total fabric heat loss							(33) + (36) = 76.5801 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	31.8976	31.5400	31.1824	29.3943	29.0367	27.2487	27.2487	26.8910	27.9639	29.0367	29.7519	30.4672 (38)
Heat transfer coeff	108.4777	108.1201	107.7625	105.9745	105.6169	103.8288	103.8288	103.4712	104.5440	105.6169	106.3321	107.0473 (39)
Average = Sum(39)m / 12 =												105.8851 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8934	0.8905	0.8875	0.8728	0.8698	0.8551	0.8551	0.8522	0.8610	0.8698	0.8757	0.8816 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8686 (42)
Average daily hot water use (litres/day)												102.3301 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	112.5632	108.4700	104.3767	100.2835	96.1903	92.0971	92.0971	96.1903	100.2835	104.3767	108.4700	112.5632 (44)
Energy conte	166.9279	145.9962	150.6550	131.3447	126.0284	108.7529	100.7755	115.6414	117.0225	136.3785	148.8678	161.6608 (45)
Energy content (annual)												Total = Sum(45)m = 1610.0517 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

25.0392	21.8994	22.5983	19.7017	18.9043	16.3129	15.1163	17.3462	17.5534	20.4568	22.3302	24.2491 (46)
Water storage loss:											
Store volume											110.0000 (47)
b) If manufacturer declared loss factor is not known :											
Hot water storage loss factor from Table 2 (kWh/litre/day)											0.0152 (51)
Volume factor from Table 2a											1.0294 (52)
Temperature factor from Table 2b											0.6000 (53)
Enter (49) or (54) in (55)											1.0327 (55)
Total storage loss											
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage											
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month											
222.2047	195.9237	205.9318	184.8384	181.3052	162.2466	156.0523	170.9182	170.5162	191.6553	202.3615	216.9376 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =											0.0000 (63)
Output from w/h											
222.2047	195.9237	205.9318	184.8384	181.3052	162.2466	156.0523	170.9182	170.5162	191.6553	202.3615	216.9376 (64)
Heat gains from water heating, kWh/month											
99.7250	88.4857	94.3142	86.4671	86.1259	78.9553	77.7293	82.6722	81.7049	89.5673	92.2935	97.9736 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	143.4319	143.4319	143.4319	143.4319	143.4319	143.4319	143.4319	143.4319	143.4319	143.4319	143.4319	143.4319 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.6034	22.7407	18.4940	14.0011	10.4660	8.8359	9.5475	12.4101	16.6569	21.1497	24.6848	26.3150 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.0504	290.0291	282.5229	266.5431	246.3715	227.4130	214.7476	211.7689	219.2751	235.2549	255.4265	274.3850 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3432	37.3432	37.3432	37.3432	37.3432	37.3432	37.3432	37.3432	37.3432	37.3432	37.3432	37.3432 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455 (71)
Water heating gains (Table 5)	134.0389	131.6751	126.7664	120.0931	115.7606	109.6601	104.4749	111.1186	113.4791	120.3861	128.1854	131.6850 (72)
Total internal gains	512.7224	510.4745	493.8129	466.6670	438.6277	411.9386	394.7995	401.3272	415.4406	442.8203	474.3263	498.4146 (73)

6. Solar gains

[Jan]				Area	Solar flux	g		FF		Access		Gains
				m2	Table 6a	Specific data		Specific data		factor		W
					W/m2	or Table 6b		or Table 6c		Table 6d		
Northeast				5.4500	11.2829	0.4000		0.8000		0.7700		13.6365 (75)
Southwest				3.6900	36.7938	0.4000		0.8000		0.7700		30.1082 (79)
West				6.4800	19.6403	0.4000		0.8000		0.7700		28.2232 (80)
Northwest				7.6500	11.2829	0.4000		0.8000		0.7700		19.1411 (81)
Solar gains	91.1089	173.2156	281.3024	416.9676	525.2658	545.9518	516.2496	432.4571	328.2033	203.7299	112.4963	75.7435 (83)
Total gains	603.8313	683.6901	775.1153	883.6346	963.8935	957.8904	911.0491	833.7843	743.6440	646.5503	586.8226	574.1581 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	77.7297	77.9868	78.2456	79.5658	79.8352	81.2101	81.2101	81.4908	80.6545	79.8352	79.2982	78.7684
alpha	6.1820	6.1991	6.2164	6.3044	6.3223	6.4140	6.4140	6.4327	6.3770	6.3223	6.2865	6.2512
util living area	0.9993	0.9981	0.9935	0.9682	0.8714	0.6719	0.4984	0.5641	0.8509	0.9853	0.9982	0.9995 (86)
MIT	20.0197	20.1408	20.3563	20.6523	20.8840	20.9829	20.9978	20.9954	20.9277	20.6239	20.2736	20.0042 (87)
Th 2	20.1731	20.1756	20.1781	20.1907	20.1932	20.2058	20.2058	20.2083	20.2008	20.1932	20.1882	20.1831 (88)
util rest of house	0.9990	0.9975	0.9912	0.9566	0.8305	0.5976	0.4101	0.4706	0.7900	0.9780	0.9975	0.9993 (89)
MIT 2	18.8437	19.0227	19.3385	19.7716	20.0780	20.1943	20.2049	20.2063	20.1406	19.7385	19.2266	18.8286 (90)
Living area fraction									fLA = Living area / (4) =			0.1814 (91)
MIT	19.0570	19.2255	19.5232	19.9314	20.2242	20.3374	20.3488	20.3495	20.2834	19.8992	19.4166	19.0419 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0570	19.2255	19.5232	19.9314	20.2242	20.3374	20.3488	20.3495	20.2834	19.8992	19.4166	19.0419 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9985	0.9965	0.9887	0.9520	0.8323	0.6104	0.4262	0.4876	0.7971	0.9745	0.9964	0.9989 (94)
Useful gains	602.9233	681.2830	766.3315	841.1959	802.2159	584.6785	388.2763	406.5265	592.7517	630.0654	584.7341	573.5253 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1600.8114	1548.8792	1403.4092	1169.0458	900.3041	595.7086	389.2315	408.6587	646.4388	982.1512	1309.6479	1588.7857 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	742.4287	583.0246	473.9858	236.0520	72.9776	0.0000	0.0000	0.0000	0.0000	261.9518	521.9379	755.3537 (98)
Space heating												3647.7123 (98)

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Space heating per m2

(98) / (4) = 30.0421 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	3647.7123 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	3830.0979 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2260.8914 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2373.9360 (310a)
Electricity used for heat distribution	62.0403 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	316.2627 (330a)
Total electricity for the above, kWh/year	316.2627 (331)
Electricity for lighting (calculated in Appendix L)	452.1641 (332)
Total delivered energy for all uses	6972.4606 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	6931.8814	0.2160	1497.2864 (367)
Electrical energy for heat distribution	62.0403	0.5190	32.1989 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1529.4853 (373)
Space and water heating			1529.4853 (376)
Pumps and fans	316.2627	0.5190	164.1403 (378)
Energy for lighting	452.1641	0.5190	234.6732 (379)
Total CO2, kg/year			1928.2988 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.8800 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		15.8800 ZC1
Total Floor Area	TFA	121.4200
Assumed number of occupants	N	2.8686
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		14.0092 ZC2
CO2 emissions from cooking, equation (L16)		1.5471 ZC3
Total CO2 emissions		31.4363 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		31.4363 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	121.4200 (1b)	x 2.8000 (2b)	= 339.9760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	121.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 339.9760 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000 / (5) = 0.1177 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3677 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3125 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.3984	0.3906	0.3828	0.3438	0.3359	0.2969	0.2969	0.2891	0.3125	0.3359	0.3516	0.3672 (22b)
Effective ac	0.5794	0.5763	0.5733	0.5591	0.5564	0.5441	0.5441	0.5418	0.5488	0.5564	0.5618	0.5674 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			23.2700	1.3258	30.8504			(27)					
Ground Floor			121.4200	0.1300	15.7846			(28a)					
External Wall	83.2400	23.2700	59.9700	0.1800	10.7946			(29a)					
Corridor	15.2900	1.8900	13.4000	0.1800	2.4120			(29a)					
Unheated	29.0100		29.0100	0.1800	5.2218			(29a)					
Total net area of external elements Aum(A, m2)			248.9600					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		66.9534			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K									250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)									15.0743 (36)				
Total fabric heat loss						(33) + (36) =	82.0277	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.0018	64.6560	64.3170	62.7249	62.4270	61.0403	61.0403	60.7835	61.5744	62.4270	63.0296	63.6596	(38)
Heat transfer coeff	147.0295	146.6837	146.3447	144.7526	144.4547	143.0680	143.0680	142.8112	143.6021	144.4547	145.0573	145.6873	(39)
Average = Sum(39)m / 12 =												144.7511	(39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2109	1.2081	1.2053	1.1922	1.1897	1.1783	1.1783	1.1762	1.1827	1.1897	1.1947	1.1999	(40)
HLP (average)												1.1922	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8686 (42)
Average daily hot water use (litres/day)												102.3301 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	112.5632	108.4700	104.3767	100.2835	96.1903	92.0971	92.0971	96.1903	100.2835	104.3767	108.4700	112.5632 (44)
Energy conte	166.9279	145.9962	150.6550	131.3447	126.0284	108.7529	100.7755	115.6414	117.0225	136.3785	148.8678	161.6608 (45)
Energy content (annual)												Total = Sum(45)m = 1610.0517 (45)
Distribution loss (46)m = 0.15 x (45)m												
	25.0392	21.8994	22.5983	19.7017	18.9043	16.3129	15.1163	17.3462	17.5534	20.4568	22.3302	24.2491 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

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Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	213.5228	188.0819	197.2499	176.4365	172.6233	153.8447	147.3704	162.2363	162.1144	182.9734	193.9596	208.2557 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	213.5228	188.0819	197.2499	176.4365	172.6233	153.8447	147.3704	162.2363	162.1144	182.9734	193.9596	208.2557 (64)
Heat gains from water heating, kWh/month	92.7795	82.2123	87.3687	79.7456	79.1804	72.2338	70.7838	75.7267	74.9835	82.6218	85.5720	91.0281 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.4319	143.4319	143.4319	143.4319	143.4319	143.4319	143.4319	143.4319	143.4319	143.4319	143.4319	143.4319	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.9003	23.0044	18.7084	14.1635	10.5874	8.9383	9.6581	12.5540	16.8500	21.3949	24.9710	26.6201	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.0504	290.0291	282.5229	266.5431	246.3715	227.4130	214.7476	211.7689	219.2751	235.2549	255.4265	274.3850	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3432	37.3432	37.3432	37.3432	37.3432	37.3432	37.3432	37.3432	37.3432	37.3432	37.3432	37.3432	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455	(71)
Water heating gains (Table 5)	124.7036	122.3398	117.4311	110.7578	106.4252	100.3247	95.1395	101.7832	104.1437	111.0508	118.8500	122.3496	(72)
Total internal gains	506.6838	504.4028	487.6920	460.4939	432.4137	405.7057	388.5748	395.1357	409.2984	436.7302	468.2772	492.3843	(73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Northeast			5.4500		11.2829		0.6300		0.7000		0.7700		18.7928 (75)
Southwest			3.6900		36.7938		0.6300		0.7000		0.7700		41.4928 (79)
West			6.4800		19.6403		0.6300		0.7000		0.7700		38.8950 (80)
Northwest			7.6500		11.2829		0.6300		0.7000		0.7700		26.3788 (81)
Solar gains	125.5595	238.7127	387.6698	574.6335	723.8819	752.3898	711.4565	595.9799	452.3052	280.7653	155.0340	104.3840	(83)
Total gains	632.2433	743.1155	875.3618	1035.1274	1156.2956	1158.0954	1100.0313	991.1157	861.6036	717.4955	623.3111	596.7683	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	57.3487	57.4839	57.6170	58.2507	58.3709	58.9366	58.9366	59.0426	58.7174	58.3709	58.1284	57.8770
alpha	4.8232	4.8323	4.8411	4.8834	4.8914	4.9291	4.9291	4.9362	4.9145	4.8914	4.8752	4.8585
util living area	0.9989	0.9974	0.9919	0.9672	0.8860	0.7215	0.5560	0.6307	0.8833	0.9858	0.9977	0.9992 (86)
MIT	19.6048	19.7598	20.0399	20.4240	20.7551	20.9383	20.9863	20.9755	20.8233	20.3895	19.9302	19.5810 (87)
Th 2	19.9113	19.9136	19.9158	19.9263	19.9282	19.9374	19.9374	19.9391	19.9339	19.9282	19.9243	19.9201 (88)
util rest of house	0.9986	0.9965	0.9888	0.9540	0.8415	0.6279	0.4300	0.5008	0.8191	0.9780	0.9968	0.9989 (89)
MIT 2	18.0469	18.2749	18.6845	19.2421	19.6858	19.8963	19.9324	19.9289	19.7852	19.2019	18.5320	18.0182 (90)
Living area fraction	18.3295	18.5443	18.9305	19.4565	19.8798	20.0854	20.1236	20.1188	19.9735	19.4174	18.7857	18.3017 (92)
Temperature adjustment	18.3295	18.5443	18.9305	19.4565	19.8798	20.0854	20.1236	20.1188	19.9735	19.4174	18.7857	18.3017 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	630.7800	739.2104	862.0151	979.6765	970.2729	743.5114	498.2234	519.4621	708.1995	697.9148	620.3009	595.7245 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	2062.7555	2001.4021	1819.1312	1528.0841	1181.6062	784.7793	504.1149	531.0801	843.4492	1273.7114	1695.0945	2054.4435 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	1065.3897	848.1928	712.0943	394.8535	157.2320	0.0000	0.0000	0.0000	0.0000	428.3927	773.8514	1085.2869 (98)
Space heating												5465.2934 (98)
Space heating per m ²												45.0115 (99)

8c. Space cooling requirement

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Not applicable

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													5845.2336 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1065.3897	848.1928	712.0943	394.8535	157.2320	0.0000	0.0000	0.0000	0.0000	428.3927	773.8514	1085.2869	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	1139.4543	907.1581	761.5982	422.3032	168.1626	0.0000	0.0000	0.0000	0.0000	458.1740	827.6486	1160.7347	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	213.5228	188.0819	197.2499	176.4365	172.6233	153.8447	147.3704	162.2363	162.1144	182.9734	193.9596	208.2557	(64)
Efficiency of water heater (217)m	88.5184	88.3499	87.9422	86.9014	84.5659	79.8000	79.8000	79.8000	79.8000	87.0084	88.1317	88.5876	(216)
Fuel for water heating, kWh/month	241.2186	212.8830	224.2950	203.0308	204.1286	192.7879	184.6747	203.3037	203.1509	210.2940	220.0793	235.0844	(219)
Water heating fuel used												2534.9308	(219)
Annual totals kWh/year													
Space heating fuel - main system												5845.2336	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												457.4067	(232)
Total delivered energy for all uses												8912.5712	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	5845.2336	0.2160	1262.5705 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2534.9308	0.2160	547.5451 (264)
Space and water heating			1810.1155 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	457.4067	0.5190	237.3941 (268)
Total CO2, kg/m2/year			2086.4346 (272)
Emissions per m2 for space and water heating			14.9079 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			1.9551 (272b)
Emissions per m2 for pumps and fans			0.3206 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.9079 * 1.00) + 1.9551 + 0.3206, rounded to 2 d.p.			17.1800 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	002	Issued on Date	29/04/2022
Assessment Reference	002	Prop Type Ref	
Property			
SAP Rating	83 B	DER	18.33
Environmental	87 B	TER	19.59
CO ₂ Emissions (t/year)	0.99	% DER<TER	6.41
General Requirements Compliance	Pass	DFEE	47.80
		TFEE	53.27
		% DFEE<TFEE	10.25
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Ground-floor flat, total floor area 66 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 19.59 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 18.33 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)53.3 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)47.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing South West:	5.05 m ² , No overhang
Windows facing West:	2.21 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	65.6200 (1b)	x 2.8000 (2b)	= 183.7360 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.7360 (5)

2. Ventilation rate

	main heating		secondary heating		other		total		m3 per hour			
Number of chimneys	0	+	0	+	0	=	0 * 40 =		0.0000 (6a)			
Number of open flues	0	+	0	+	0	=	0 * 20 =		0.0000 (6b)			
Number of intermittent fans							0 * 10 =		0.0000 (7a)			
Number of passive vents							0 * 10 =		0.0000 (7b)			
Number of flueless gas fires							0 * 40 =		0.0000 (7c)			
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =		0.0000 (8)			
Pressure test									Yes			
Measured/design AP50									3.0000			
Infiltration rate									0.1500 (18)			
Number of sides sheltered									3 (19)			
Shelter factor							(20) = 1 - [0.075 x (19)] =		0.7750 (20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =		0.1163 (21)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			7.2600	1.1450	8.3130		(27)					
Ground Floor			65.6200	0.1000	6.5620		(28a)					
External Wall	31.7500	7.2600	24.4900	0.1500	3.6735		(29a)					
Corridor	27.9400	1.8900	26.0500	0.2500	6.5125		(29a)					
Core	19.1000		19.1000	0.2500	4.7750		(29a)					
Total net area of external elements Aum(A, m2)			144.4100				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		31.7260		(33)					
Party Wall 1			15.2000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								10.4274 (36)				
Total fabric heat loss						(33) + (36) =	42.1534 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 16.1113	Feb 15.9351	Mar 15.7589	Apr 14.8778	May 14.7016	Jun 13.8205	Jul 13.8205	Aug 13.6443	Sep 14.1729	Oct 14.7016	Nov 15.0540	Dec 15.4064 (38)
Heat transfer coeff	58.2647	58.0885	57.9122	57.0312	56.8550	55.9739	55.9739	55.7977	56.3263	56.8550	57.2074	57.5598 (39)
Average = Sum(39)m / 12 =												56.9871 (39)
HLP	Jan 0.8879	Feb 0.8852	Mar 0.8825	Apr 0.8691	May 0.8664	Jun 0.8530	Jul 0.8530	Aug 0.8503	Sep 0.8584	Oct 0.8664	Nov 0.8718	Dec 0.8772 (40)
HLP (average)												0.8684 (40)
Days in month												
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1353 (42)
Average daily hot water use (litres/day)												84.9131 (43)
Daily hot water use	Jan 93.4044	Feb 90.0079	Mar 86.6114	Apr 83.2149	May 79.8183	Jun 76.4218	Jul 76.4218	Aug 79.8183	Sep 83.2149	Oct 86.6114	Nov 90.0079	Dec 93.4044 (44)
Energy conte	138.5161	121.1471	125.0129	108.9893	104.5778	90.2427	83.6231	95.9588	97.1048	113.1663	123.5299	134.1454 (45)
Energy content (annual)												Total = Sum(45)m = 1336.0141 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

20.7774	18.1721	18.7519	16.3484	15.6867	13.5364	12.5435	14.3938	14.5657	16.9749	18.5295	20.1218 (46)
Water storage loss:											
Store volume											110.0000 (47)
b) If manufacturer declared loss factor is not known :											
Hot water storage loss factor from Table 2 (kWh/litre/day)											0.0152 (51)
Volume factor from Table 2a											1.0294 (52)
Temperature factor from Table 2b											0.6000 (53)
Enter (49) or (54) in (55)											1.0327 (55)
Total storage loss											
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage											
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month											
193.7929	171.0745	180.2897	162.4830	159.8546	143.7364	138.8999	151.2356	150.5985	168.4431	177.0235	189.4222 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =											0.0000 (63)
Output from w/h											
193.7929	171.0745	180.2897	162.4830	159.8546	143.7364	138.8999	151.2356	150.5985	168.4431	177.0235	189.4222 (64)
Total per year (kWh/year) = Sum(64)m =											1986.8539 (64)
Heat gains from water heating, kWh/month											
90.2780	80.2233	85.7882	79.0339	78.9936	72.8006	72.0261	76.1277	75.0823	81.8492	83.8686	88.8248 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	106.7645	106.7645	106.7645	106.7645	106.7645	106.7645	106.7645	106.7645	106.7645	106.7645	106.7645	106.7645 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.2781	16.2344	13.2027	9.9953	7.4716	6.3078	6.8158	8.8595	11.8912	15.0986	17.6223	18.7861 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	186.8669	188.8059	183.9195	173.5168	160.3853	148.0435	139.7985	137.8594	142.7458	153.1485	166.2800	178.6218 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.6764	33.6764	33.6764	33.6764	33.6764	33.6764	33.6764	33.6764	33.6764	33.6764	33.6764	33.6764 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116 (71)
Water heating gains (Table 5)	121.3415	119.3800	115.3068	109.7693	106.1741	101.1120	96.8093	102.3222	104.2810	110.0124	116.4842	119.3882 (72)
Total internal gains	381.5157	379.4497	367.4583	348.3107	329.0604	310.4927	298.4530	304.0704	313.9473	333.2889	355.4159	371.8254 (73)

6. Solar gains

[Jan]			Area	Solar flux	g	FF	Access	Gains				
			m2	Table 6a	Specific data	Specific data	factor	W				
				W/m2	or Table 6b	or Table 6c	Table 6d					
Southwest			5.0500	36.7938	0.4000	0.8000	0.7700	41.2050 (79)				
West			2.2100	19.6403	0.4000	0.8000	0.7700	9.6255 (80)				
Solar gains	50.8305	89.0168	127.0428	164.2155	188.7042	189.0528	181.5825	163.3053	140.0491	99.9147	61.3559	43.1784 (83)
Total gains	432.3462	468.4665	494.5011	512.5262	517.7646	499.5455	480.0354	467.3757	453.9965	433.2036	416.7718	415.0038 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	78.2111	78.4484	78.6871	79.9027	80.1503	81.4120	81.4120	81.6691	80.9026	80.1503	79.6566	79.1689
alpha	6.2141	6.2299	6.2458	6.3268	6.3434	6.4275	6.4275	6.4446	6.3935	6.3434	6.3104	6.2779
util living area												
	0.9964	0.9932	0.9846	0.9558	0.8727	0.6910	0.5096	0.5439	0.7893	0.9586	0.9919	0.9972 (86)
MIT												
	20.1850	20.2934	20.4692	20.6980	20.8840	20.9802	20.9975	20.9963	20.9542	20.7344	20.4244	20.1669 (87)
Th 2												
	20.1778	20.1801	20.1824	20.1938	20.1961	20.2076	20.2076	20.2099	20.2030	20.1961	20.1915	20.1870 (88)
util rest of house												
	0.9953	0.9911	0.9796	0.9408	0.8321	0.6162	0.4197	0.4533	0.7216	0.9416	0.9889	0.9963 (89)
MIT 2												
	19.0886	19.2478	19.5037	19.8361	20.0807	20.1942	20.2066	20.2083	20.1672	19.8918	19.4478	19.0692 (90)
Living area fraction												
	19.5108	19.6504	19.8755	20.1680	20.3900	20.4969	20.5112	20.5118	20.4703	20.2163	19.8239	19.4919 (92)
Temperature adjustment												
	19.5108	19.6504	19.8755	20.1680	20.3900	20.4969	20.5112	20.5118	20.4703	20.2163	19.8239	19.4919 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9940	0.9893	0.9772	0.9402	0.8428	0.6444	0.4545	0.4883	0.7457	0.9421	0.9871	0.9953 (94)
Useful gains	429.7722	463.4661	483.2250	481.8842	436.3580	321.8888	218.1565	228.2298	338.5410	408.1110	411.4018	413.0403 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
	886.2527	856.8298	774.6048	642.6284	494.0712	330.0712	218.9248	229.4269	358.8144	546.7317	727.9015	880.1984 (97)
Month fracti												
	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
	339.6215	264.3404	216.7865	115.7359	42.9386	0.0000	0.0000	0.0000	0.0000	103.1338	227.8798	347.5656 (98)
Space heating												
												1658.0021 (98)
Space heating per m2												
												(98) / (4) = 25.2667 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	1658.0021	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1740.9022	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating:		
Annual water heating requirement	1986.8539	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2086.1966	(310a)
Electricity used for heat distribution	38.2710	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	176.5244	(330a)
Total electricity for the above, kWh/year	176.5244	(331)
Electricity for lighting (calculated in Appendix L)	322.7961	(332)
Total delivered energy for all uses	4326.4193	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	4276.0880	0.2160	923.6350 (367)
Electrical energy for heat distribution	38.2710	0.5190	19.8626 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			943.4977 (373)
Space and water heating			943.4977 (376)
Pumps and fans	176.5244	0.5190	91.6161 (378)
Energy for lighting	322.7961	0.5190	167.5312 (379)
Total CO2, kg/year			1202.6450 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			18.3300 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		18.3300	ZC1
Total Floor Area	TFA	65.6200	
Assumed number of occupants	N	2.1353	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.8749	ZC2
CO2 emissions from cooking, equation (L16)		2.5944	ZC3
Total CO2 emissions		37.7994	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		37.7994	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	65.6200 (1b)	x 2.8000 (2b)	= 183.7360 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.7360 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	+	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) = 0.1089 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3589 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2781 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3546	0.3476	0.3407	0.3059	0.2990	0.2642	0.2642	0.2573	0.2781	0.2990	0.3129	0.3268 (22b)
Effective ac	0.5629	0.5604	0.5580	0.5468	0.5447	0.5349	0.5349	0.5331	0.5387	0.5447	0.5489	0.5534 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			7.2600	1.3258	9.6250			(27)					
Ground Floor			65.6200	0.1300	8.5306			(28a)					
External Wall	31.7500	7.2600	24.4900	0.1800	4.4082			(29a)					
Corridor	27.9400	1.8900	26.0500	0.1800	4.6890			(29a)					
Core	19.1000		19.1000	0.1800	3.4380			(29a)					
Total net area of external elements Aum(A, m2)			144.4100					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.5808			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								8.9622 (36)					
Total fabric heat loss						(33) + (36) =		41.5430 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 34.1283	Feb 33.9802	Mar 33.8352	Apr 33.1537	May 33.0262	Jun 32.4327	Jul 32.4327	Aug 32.3227	Sep 32.6613	Oct 33.0262	Nov 33.2841	Dec 33.5538	(38)
Heat transfer coeff	75.6713	75.5232	75.3782	74.6967	74.5692	73.9757	73.9757	73.8657	74.2043	74.5692	74.8271	75.0968	(39)
Average = Sum(39)m / 12 =												74.6961	(39)
HLP	Jan 1.1532	Feb 1.1509	Mar 1.1487	Apr 1.1383	May 1.1364	Jun 1.1273	Jul 1.1273	Aug 1.1257	Sep 1.1308	Oct 1.1364	Nov 1.1403	Dec 1.1444	(40)
HLP (average)												1.1383	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1353 (42)
Average daily hot water use (litres/day)												84.9131 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	93.4044	90.0079	86.6114	83.2149	79.8183	76.4218	76.4218	79.8183	83.2149	86.6114	90.0079	93.4044 (44)
Energy content (annual)	138.5161	121.1471	125.0129	108.9893	104.5778	90.2427	83.6231	95.9588	97.1048	113.1663	123.5299	134.1454 (45)
Distribution loss	Total = Sum(45)m =											1336.0141 (45)
	(46)m = 0.15 x (45)m											
	20.7774	18.1721	18.7519	16.3484	15.6867	13.5364	12.5435	14.3938	14.5657	16.9749	18.5295	20.1218 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (58)
Total heat required for water heating calculated for each month	185.1110	163.2328	171.6078	154.0811	151.1727	135.3345	130.2180	142.5537	142.1967	159.7612	168.6217	180.7403 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
	Solar input (sum of months) = Sum(63)m = 0.0000 (63)											
Output from w/h	185.1110	163.2328	171.6078	154.0811	151.1727	135.3345	130.2180	142.5537	142.1967	159.7612	168.6217	180.7403 (64)
	Total per year (kWh/year) = Sum(64)m = 1884.6315 (64)											
Heat gains from water heating, kWh/month	83.3325	73.9500	78.8427	72.3124	72.0480	66.0792	65.0806	69.1822	68.3608	74.9037	77.1472	81.8793 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	106.7645	106.7645	106.7645	106.7645	106.7645	106.7645	106.7645	106.7645	106.7645	106.7645	106.7645	106.7645 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.8245	16.7198	13.5975	10.2941	7.6950	6.4964	7.0196	9.1244	12.2467	15.5500	18.1492	19.3477 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	186.8669	188.8059	183.9195	173.5168	160.3853	148.0435	139.7985	137.8594	142.7458	153.1485	166.2800	178.6218 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.6764	33.6764	33.6764	33.6764	33.6764	33.6764	33.6764	33.6764	33.6764	33.6764	33.6764	33.6764 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116 (71)
Water heating gains (Table 5)	112.0061	110.0446	105.9714	100.4339	96.8388	91.7766	87.4739	92.9868	94.9456	100.6770	107.1488	110.0528 (72)
Total internal gains	375.7268	373.5997	361.5177	342.2742	322.9484	304.3459	292.3214	297.9999	307.9675	327.4049	349.6074	366.0517 (73)

[Jan				Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Southwest				5.0500	36.7938	0.6300	0.7000		56.7856 (79)			
West				2.2100	19.6403	0.6300	0.7000	0.7700	13.2651 (80)			
Solar gains	70.0507	122.6763	175.0809	226.3094	260.0580	260.5384	250.2433	225.0551	193.0052	137.6950	84.5561	59.5052 (83)
Total gains	445.7775	496.2760	536.5986	568.5837	583.0064	564.8843	542.5647	523.0550	500.9727	465.0999	434.1635	425.5569 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil/m, (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	60.2203	60.3383	60.4544	61.0060	61.1103	61.6006	61.6006	61.6923	61.4108	61.1103	60.8996	60.6810
alpha	5.0147	5.0226	5.0303	5.0671	5.0740	5.1067	5.1067	5.1128	5.0941	5.0740	5.0600	5.0454
util living area	0.9965	0.9934	0.9856	0.9623	0.8986	0.7547	0.5814	0.6226	0.8449	0.9687	0.9930	0.9972 (86)
MIT	19.8278	19.9655	20.1924	20.4884	20.7567	20.9323	20.9856	20.9797	20.8725	20.5337	20.1269	19.8005 (87)
Th 2	19.9576	19.9595	19.9613	19.9697	19.9712	19.9786	19.9786	19.9799	19.9757	19.9712	19.9680	19.9647 (88)
util rest of house	0.9954	0.9912	0.9805	0.9478	0.8580	0.6649	0.4559	0.4978	0.7729	0.9537	0.9902	0.9963 (89)
MIT 2	18.4050	18.6067	18.9369	19.3647	19.7262	19.9317	19.9731	19.9714	19.8731	19.4349	18.8488	18.3702 (90)
Living area fraction									fLA = Living area / (4) =			0.3851 (91)
MIT	18.9529	19.1300	19.4204	19.7975	20.1231	20.3170	20.3630	20.3597	20.2580	19.8580	19.3410	18.9210 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9529	19.1300	19.4204	19.7975	20.1231	20.3170	20.3630	20.3597	20.2580	19.8580	19.3410	18.9210 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9938	0.9888	0.9770	0.9448	0.8648	0.6969	0.5047	0.5462	0.7952	0.9516	0.9878	0.9950 (94)
Useful gains	443.0035	490.7110	524.2441	537.1980	504.2091	393.6868	273.8059	285.6881	398.3753	442.6018	428.8812	423.4317 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
	1108.8039	1074.6947	973.9147	814.0040	628.1005	422.9200	278.3712	292.4844	456.9481	690.3647	915.9580	1105.5007 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
	495.3555	392.4370	334.5549	199.3003	92.1752	0.0000	0.0000	0.0000	0.0000	184.3356	350.6953	507.4593 (98)
Space heating												2556.3132 (99)
Space heating per m2												38.9563 (99)
										(98) / (4) =		

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2734.0248 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	495.3555	392.4370	334.5549	199.3003	92.1752	0.0000	0.0000	0.0000	0.0000	184.3356	350.6953	507.4593	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	529.7920	419.7188	357.8127	213.1554	98.5831	0.0000	0.0000	0.0000	0.0000	197.1504	375.0752	542.7372	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	185.1110	163.2328	171.6078	154.0811	151.1727	135.3345	130.2180	142.5537	142.1967	159.7612	168.6217	180.7403	(64)
Efficiency of water heater (217)m	87.3151	87.0704	86.5648	85.5013	83.5413	79.8000	79.8000	79.8000	79.8000	85.1961	86.7243	87.4215	(216)
Fuel for water heating, kWh/month	212.0034	187.4721	198.2421	180.2091	180.9557	169.5922	163.1805	178.6387	178.1913	187.5216	194.4343	206.7459	(219)
Water heating fuel used												2237.1868	(219)
Annual totals kWh/year													
Space heating fuel - main system												2734.0248	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												332.4474	(232)
Total delivered energy for all uses												5378.6590	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2734.0248	0.2160	590.5494 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2237.1868	0.2160	483.2324 (264)
Space and water heating			1073.7817 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	332.4474	0.5190	172.5402 (268)
Total CO2, kg/m2/year			1285.2469 (272)
Emissions per m2 for space and water heating			16.3636 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.6294 (272b)
Emissions per m2 for pumps and fans			0.5932 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.3636 * 1.00) + 2.6294 + 0.5932, rounded to 2 d.p.			19.5900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	003	Issued on Date	29/04/2022
Assessment Reference	003	Prop Type Ref	
Property			
SAP Rating	85 B	DER	15.32
Environmental	89 B	TER	17.06
CO ₂ Emissions (t/year)	0.89	% DER<TER	10.19
General Requirements Compliance	Fail	DFEE	36.82
		TFEE	44.38
		% DFEE<TFEE	17.03
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 70 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 17.06 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.32 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)44.4 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)36.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing North:	1.37 m ² , No overhang
Windows facing North East:	9.00 m ² , No overhang
Windows facing North West:	6.24 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Exposed floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	69.9600 (1b)	x 2.5000 (2b)	= 174.9000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.9000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			16.6100	1.1450	19.0191		(27)
Exposed Floor			18.7900	0.1000	1.8790		(28b)
External Wall	37.2300	16.6100	20.6200	0.1500	3.0930		(29a)
Corridor	5.6000	1.8900	3.7100	0.2500	0.9275		(29a)
Total net area of external elements Aum(A, m2)			61.6200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		26.8086		(33)
Party Wall			39.7800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.2080 (36)
Total fabric heat loss							(33) + (36) = 35.0166 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	16.1644	15.9804	15.7964	14.8766	14.6926	13.7727	13.7727	13.5887	14.1407	14.6926	15.0605	15.4285 (38)
Average = Sum(39)m / 12 =	51.1810	50.9970	50.8130	49.8931	49.7092	48.7893	48.7893	48.6053	49.1572	49.7092	50.0771	50.4451 (39)
	51.1810	50.9970	50.8130	49.8931	49.7092	48.7893	48.7893	48.6053	49.1572	49.7092	50.0771	49.8471 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7316	0.7289	0.7263	0.7132	0.7105	0.6974	0.6974	0.6948	0.7026	0.7105	0.7158	0.7211 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2452 (42)
Average daily hot water use (litres/day)												87.5224 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.2746	92.7737	89.2728	85.7719	82.2710	78.7702	78.7702	82.2710	85.7719	89.2728	92.7737	96.2746 (44)
Energy conte	142.7725	124.8697	128.8544	112.3384	107.7913	93.0157	86.1928	98.9074	100.0887	116.6437	127.3258	138.2675 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1377.0680 (45)
	21.4159	18.7305	19.3282	16.8508	16.1687	13.9524	12.9289	14.8361	15.0133	17.4966	19.0989	20.7401 (46)

Water storage loss:													
Store volume												110.0000 (47)	
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)	
Volume factor from Table 2a												1.0294 (52)	
Temperature factor from Table 2b												0.6000 (53)	
Enter (49) or (54) in (55)												1.0327 (55)	
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
Solar input	198.0493	174.7972	184.1312	165.8321	163.0681	146.5094	141.4696	154.1842	153.5824	171.9205	180.8194	193.5443	(62)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
	Solar input (sum of months) = Sum(63)m =											0.0000 (63)	
Output from w/h	198.0493	174.7972	184.1312	165.8321	163.0681	146.5094	141.4696	154.1842	153.5824	171.9205	180.8194	193.5443	(64)
	Total per year (kWh/year) = Sum(64)m =											2027.9078 (64)	
Heat gains from water heating, kWh/month													
	91.6933	81.4611	87.0655	80.1475	80.0621	73.7227	72.8805	77.1082	76.0744	83.0055	85.1308	90.1954	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.5809	15.6152	12.6991	9.6140	7.1866	6.0672	6.5559	8.5216	11.4376	14.5227	16.9501	18.0695 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.2037	199.2500	194.0933	183.1152	169.2573	156.2328	147.5316	145.4853	150.6420	161.6202	175.4781	188.5025 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061 (71)
Water heating gains (Table 5)	123.2437	121.2219	117.0236	111.3159	107.6103	102.3926	97.9577	103.6400	105.6589	111.5665	118.2372	121.2304 (72)
Total internal gains	394.7055	392.7644	380.4932	360.7224	340.7315	321.3699	308.7225	314.3242	324.4159	344.3867	367.3426	384.4797 (73)

[Jan	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	1.3700	10.6334	0.4000	0.8000	0.7700	3.2305 (74)
Northeast	9.0000	11.2829	0.4000	0.8000	0.7700	22.5189 (75)
Northwest	6.2400	11.2829	0.4000	0.8000	0.7700	15.6131 (81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9944	0.9884	0.9640	0.8585	0.6456	0.4320	0.3038	0.3517	0.6200	0.9178	0.9862	0.9957 (94)
Useful gains	433.6212	471.0212	511.7237	521.2864	433.9619	291.4939	194.1982	203.2275	314.6106	409.8978	413.5421	416.5039 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	794.1673	767.6309	695.6746	576.9440	440.4774	291.7681	194.2133	203.2714	318.1041	488.0672	650.2053	786.9936 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	268.2463	199.3217	136.8595	40.0734	4.8475	0.0000	0.0000	0.0000	0.0000	58.1581	170.3975	275.6443 (98)
Space heating												1153.5484 (98)
Space heating per m2										(98) / (4) =		16.4887 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	1153.5484	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1211.2258	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating:		
Annual water heating requirement	2027.9078	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2129.3032	(310a)
Electricity used for heat distribution	33.4053	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	168.0352	(330a)
Total electricity for the above, kWh/year	168.0352	(331)
Electricity for lighting (calculated in Appendix L)	310.4834	(332)
Total delivered energy for all uses	3819.0475	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3732.4346	0.2160	806.2059 (367)
Electrical energy for heat distribution	33.4053	0.5190	17.3373 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			823.5432 (373)
Space and water heating			823.5432 (376)
Pumps and fans	168.0352	0.5190	87.2103 (378)
Energy for lighting	310.4834	0.5190	161.1409 (379)
Total CO2, kg/year			1071.8943 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.3200 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		15.3200	ZC1
Total Floor Area	TFA	69.9600	
Assumed number of occupants	N	2.2452	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.7037	ZC2
CO2 emissions from cooking, equation (L16)		2.4712	ZC3
Total CO2 emissions		34.4948	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		34.4948	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	69.9600 (1b)	x 2.5000 (2b)	= 174.9000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.9000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					20.0000 / (5) = 0.1144 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3644 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3097 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.3949	0.3871	0.3794	0.3407	0.3329	0.2942	0.2942	0.2865	0.3097	0.3329	0.3484	0.3639 (22b)
	0.5780	0.5749	0.5720	0.5580	0.5554	0.5433	0.5433	0.5410	0.5480	0.5554	0.5607	0.5662 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			15.6100	1.3258	20.6951		(27)
Exposed Floor			18.7900	0.1300	2.4427		(28b)
External Wall	37.2300	15.6100	21.6200	0.1800	3.8916		(29a)
Corridor	5.6000	1.8900	3.7100	0.1800	0.6678		(29a)
Total net area of external elements Aum(A, m ²)			61.6200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.5872		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.2738 (36)
Total fabric heat loss						(33) + (36) =	36.8610 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	33.3581	33.1834	33.0121	32.2077	32.0572	31.3565	31.3565	31.2268	31.6264	32.0572	32.3616	32.6799 (38)
Heat transfer coeff	70.2191	70.0443	69.8731	69.0686	68.9181	68.2175	68.2175	68.0878	68.4874	68.9181	69.2226	69.5409 (39)
Average = Sum(39)m / 12 =												69.0679 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0037	1.0012	0.9988	0.9873	0.9851	0.9751	0.9751	0.9732	0.9790	0.9851	0.9895	0.9940 (40)
HLP (average)												0.9872 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2452 (42)
Average daily hot water use (litres/day)												87.5224 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	96.2746	92.7737	89.2728	85.7719	82.2710	78.7702	78.7702	82.2710	85.7719	89.2728	92.7737	96.2746 (44)
Energy content (annual)	142.7725	124.8697	128.8544	112.3384	107.7913	93.0157	86.1928	98.9074	100.0887	116.6437	127.3258	138.2675 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.4159	18.7305	19.3282	16.8508	16.1687	13.9524	12.9289	14.8361	15.0133	17.4966	19.0989	20.7401 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	189.3674	166.9555	175.4493	157.4302	154.3862	138.1076	132.7877	145.5023	145.1806	163.2386	172.4176	184.8624 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	189.3674	166.9555	175.4493	157.4302	154.3862	138.1076	132.7877	145.5023	145.1806	163.2386	172.4176	184.8624 (64)
Heat gains from water heating, kWh/month	84.7478	75.1878	80.1200	73.4260	73.1165	67.0012	65.9350	70.1626	69.3530	76.0600	78.4093	83.2499 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1925.6854 (64)												

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)m
(66)m	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.5806	15.6149	12.6989	9.6139	7.1865	6.0671	6.5558	8.5214	11.4374	14.5225	16.9499	18.0692	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.2037	199.2500	194.0933	183.1152	169.2573	156.2328	147.5316	145.4853	150.6420	161.6202	175.4781	188.5025	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	(71)
Water heating gains (Table 5)	113.9083	111.8866	107.6882	101.9805	98.2749	93.0572	88.6223	94.3046	96.3236	102.2311	108.9018	111.8950	(72)
Total internal gains	388.3699	386.4288	374.1577	354.3869	334.3960	315.0345	302.3870	307.9886	318.0804	338.0511	361.0070	378.1440	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				1.2900	10.6334	0.6300	0.7000	0.7700	4.1921 (74)			
Northeast				8.4600	11.2829	0.6300	0.7000	0.7700	29.1719 (75)			
Northwest				5.8600	11.2829	0.6300	0.7000	0.7700	20.2065 (81)			
Solar gains	53.5705	108.5225	194.7025	319.2669	429.2206	457.7249	428.1339	341.2003	237.0276	132.3691	67.3023	43.8197 (83)
Total gains	441.9404	494.9514	568.8601	673.6538	763.6166	772.7594	730.5209	649.1889	555.1079	470.4202	428.3094	421.9637 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	69.1882	69.3608	69.5308	70.3406	70.4943	71.2183	71.2183	71.3540	70.9376	70.4943	70.1842	69.8629
alpha	5.6125	5.6241	5.6354	5.6894	5.6996	5.7479	5.7479	5.7569	5.7292	5.6996	5.6789	5.6575
util living area	0.9974	0.9945	0.9827	0.9255	0.7674	0.5555	0.4094	0.4787	0.7752	0.9669	0.9944	0.9980 (86)
MIT	19.9906	20.1232	20.3731	20.7064	20.9240	20.9899	20.9985	20.9966	20.9415	20.6375	20.2584	19.9676 (87)
Th 2	20.0802	20.0823	20.0844	20.0940	20.0958	20.1041	20.1041	20.1057	20.1009	20.0958	20.0921	20.0883 (88)
util rest of house	0.9965	0.9927	0.9768	0.9024	0.7130	0.4819	0.3269	0.3876	0.7008	0.9519	0.9922	0.9973 (89)
MIT 2	18.7316	18.9262	19.2888	19.7591	20.0265	20.0979	20.1036	20.1043	20.0563	19.6769	19.1313	18.7040 (90)
Living area fraction	19.1869	19.3590	19.6809	20.1017	20.3511	20.4205	20.4272	20.4270	20.3764	20.0243	19.5389	19.1610 (92)
Temperature adjustment	19.1869	19.3590	19.6809	20.1017	20.3511	20.4205	20.4272	20.4270	20.3764	20.0243	19.5389	19.1610 (93)
adjusted MIT	19.1869	19.3590	19.6809	20.1017	20.3511	20.4205	20.4272	20.4270	20.3764	20.0243	19.5389	19.1610 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9954	0.9908	0.9736	0.9026	0.7292	0.5083	0.3568	0.4206	0.7252	0.9504	0.9904	0.9964	(94)
Useful gains	439.9002	490.3990	553.8501	608.0477	556.8111	392.8094	260.6312	273.0779	402.5599	447.1062	424.1902	420.4393	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1045.3430	1012.7734	920.9892	773.6843	596.2147	397.0586	261.0848	274.1898	429.8561	649.5042	861.0529	1040.4015	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	450.4494	351.0356	273.1515	119.2583	29.3163	0.0000	0.0000	0.0000	0.0000	150.5841	314.5411	461.2519	(98)
Space heating													2149.5883 (98)
Space heating per m2													30.7260 (99)
	(98) / (4) =												

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2299.0249 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	450.4494	351.0356	273.1515	119.2583	29.3163	0.0000	0.0000	0.0000	0.0000	150.5841	314.5411	461.2519	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	481.7641	375.4391	292.1407	127.5490	31.3543	0.0000	0.0000	0.0000	0.0000	161.0525	336.4076	493.3175	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	189.3674	166.9555	175.4493	157.4302	154.3862	138.1076	132.7877	145.5023	145.1806	163.2386	172.4176	184.8624	(64)
Efficiency of water heater (217)m	87.0456	86.7508	85.9906	84.0850	81.3346	79.8000	79.8000	79.8000	79.8000	84.5995	86.3982	87.1564	(216)
Fuel for water heating, kWh/month	217.5497	192.4540	204.0332	187.2275	189.8161	173.0671	166.4006	182.3338	181.9305	192.9546	199.5616	212.1044	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													2299.0249 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													75.0000 (231)
Electricity for lighting (calculated in Appendix L)													310.4787 (232)
Total delivered energy for all uses													4983.9366 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2299.0249	0.2160	496.5894 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2299.4330	0.2160	496.6775 (264)
Space and water heating			993.2669 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	310.4787	0.5190	161.1384 (268)
Total CO2, kg/m2/year			1193.3304 (272)
Emissions per m2 for space and water heating			14.1976 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3033 (272b)
Emissions per m2 for pumps and fans			0.5564 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.1976 * 1.00) + 2.3033 + 0.5564, rounded to 2 d.p.			17.0600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	004			Issued on Date	29/04/2022
Assessment Reference	004	Prop Type Ref			
Property					
SAP Rating	84 B	DER	17.29	TER	19.00
Environmental	87 B	% DER<TER	8.99		
CO ₂ Emissions (t/year)	1.05	DFEE	46.45	TFEE	54.97
General Requirements Compliance	Pass	% DFEE<TFEE	15.51		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 75 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 19.00 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 17.29 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)55.0 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)46.4 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing North East:	9.93 m ² , No overhang
Windows facing East:	2.21 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Exposed floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	74.6300 (1b)	x 2.5000 (2b)	= 186.5750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 186.5750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			12.1400	1.1450	13.9008		(27)
Exposed Floor			74.6300	0.1000	7.4630		(28b)
External Wall	31.9300	12.1400	19.7900	0.1500	2.9685		(29a)
Corridor	25.0000	1.8900	23.1100	0.2500	5.7775		(29a)
Total net area of external elements Aum(A, m2)			131.5600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		31.9998		(33)
Party Wall			41.5000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.0894 (36)
Total fabric heat loss						(33) + (36) =	47.0892 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	16.3602	16.1813	16.0024	15.1077	14.9287	14.0341	14.0341	13.8551	14.3919	14.9287	15.2866	15.6445 (38)
Average = Sum(39)m / 12 =	63.4494	63.2705	63.0915	62.1968	62.0179	61.1232	61.1232	60.9443	61.4811	62.0179	62.3758	62.7337 (39)
												62.1521 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8502	0.8478	0.8454	0.8334	0.8310	0.8190	0.8190	0.8166	0.8238	0.8310	0.8358	0.8406 (40)
Days in month												0.8328 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3531 (42)
Average daily hot water use (litres/day)												90.0860 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	99.0946	95.4911	91.8877	88.2843	84.6808	81.0774	81.0774	84.6808	88.2843	91.8877	95.4911	99.0946 (44)
Energy content (annual)	146.9544	128.5272	132.6286	115.6288	110.9486	95.7402	88.7174	101.8045	103.0204	120.0603	131.0552	142.3175 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1417.4032 (45)
	22.0432	19.2791	19.8943	17.3443	16.6423	14.3610	13.3076	15.2707	15.4531	18.0090	19.6583	21.3476 (46)

Water storage loss:													
Store volume												110.0000 (47)	
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)	
Volume factor from Table 2a												1.0294 (52)	
Temperature factor from Table 2b												0.6000 (53)	
Enter (49) or (54) in (55)												1.0327 (55)	
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	202.2312	178.4547	187.9054	169.1225	166.2254	149.2339	143.9942	157.0813	156.5141	175.3371	184.5489	197.5943	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
												Solar input (sum of months) = Sum(63)m =	0.0000 (63)
Output from w/h													
	202.2312	178.4547	187.9054	169.1225	166.2254	149.2339	143.9942	157.0813	156.5141	175.3371	184.5489	197.5943	(64)
												Total per year (kWh/year) = Sum(64)m =	2068.2430 (64)
Heat gains from water heating, kWh/month													
	93.0838	82.6773	88.3205	81.2415	81.1119	74.6286	73.7200	78.0714	77.0492	84.1415	86.3708	91.5420	(65)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9963	0.9935	0.9832	0.9399	0.8106	0.5894	0.4156	0.4696	0.7624	0.9593	0.9920	0.9971 (94)
Useful gains	442.9313	474.3458	508.6342	535.1094	494.4812	356.1631	238.7787	249.8275	368.5872	423.4939	421.2558	426.3399 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	964.1868	931.4744	843.0666	702.4877	541.1039	360.9735	239.1895	250.7075	391.6944	594.5587	791.8864	958.5183 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	387.8141	307.1904	248.8177	120.5124	34.6873	0.0000	0.0000	0.0000	0.0000	127.2722	266.8540	395.9407 (98)
Space heating												1889.0888 (98)
Space heating per m2												25.3127 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1889.0888 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1983.5432 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2068.2430 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2171.6551 (310a)
Electricity used for heat distribution	41.5520 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	179.2519 (330a)
Total electricity for the above, kWh/year	179.2519 (331)
Electricity for lighting (calculated in Appendix L)	332.5970 (332)
Total delivered energy for all uses	4667.0472 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	4642.6797	0.2160	1002.8188 (367)
Electrical energy for heat distribution	41.5520	0.5190	21.5655 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1024.3843 (373)
Space and water heating			1024.3843 (376)
Pumps and fans	179.2519	0.5190	93.0318 (378)
Energy for lighting	332.5970	0.5190	172.6178 (379)
Total CO2, kg/year			1290.0339 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			17.2900 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		17.2900 ZC1
Total Floor Area	TFA	74.6300
Assumed number of occupants	N	2.3531
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.5040 ZC2
CO2 emissions from cooking, equation (L16)		2.3513 ZC3
Total CO2 emissions		36.1453 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		36.1453 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	74.6300 (1b)	x 2.5000 (2b)	= 186.5750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 186.5750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1608 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4108 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3184 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4059	0.3980	0.3900	0.3502	0.3422	0.3024	0.3024	0.2945	0.3184	0.3422	0.3582	0.3741 (22b)
Effective ac	0.5824	0.5792	0.5760	0.5613	0.5586	0.5457	0.5457	0.5434	0.5507	0.5586	0.5641	0.5700 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			12.1400	1.3258	16.0947		(27)
Exposed Floor			74.6300	0.1300	9.7019		(28b)
External Wall	31.9300	12.1400	19.7900	0.1800	3.5622		(29a)
Corridor	25.0000	1.8900	23.1100	0.1800	4.1598		(29a)
Total net area of external elements Aum(A, m ²)			131.5600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.4086		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.8043 (36)
Total fabric heat loss						(33) + (36) =	49.2129 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	35.8572	35.6602	35.4672	34.5604	34.3907	33.6009	33.6009	33.4546	33.9051	34.3907	34.7339	35.0928 (38)
Heat transfer coeff	85.0701	84.8731	84.6801	83.7733	83.6036	82.8138	82.8138	82.6675	83.1180	83.6036	83.9468	84.3056 (39)
Average = Sum(39)m / 12 =												83.7724 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1399	1.1373	1.1347	1.1225	1.1202	1.1097	1.1097	1.1077	1.1137	1.1202	1.1248	1.1296 (40)
HLP (average)												1.1225 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3531 (42)
Average daily hot water use (litres/day)												90.0860 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	99.0946	95.4911	91.8877	88.2843	84.6808	81.0774	81.0774	84.6808	88.2843	91.8877	95.4911	99.0946 (44)
Energy conte	146.9544	128.5272	132.6286	115.6288	110.9486	95.7402	88.7174	101.8045	103.0204	120.0603	131.0552	142.3175 (45)
Energy content (annual)										Total = Sum(45)m =		1417.4032 (45)
Distribution loss (46)m = 0.15 x (45)m	22.0432	19.2791	19.8943	17.3443	16.6423	14.3610	13.3076	15.2707	15.4531	18.0090	19.6583	21.3476 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	193.5493	170.6130	179.2235	160.7207	157.5435	140.8321	135.3123	148.3994	148.1122	166.6552	176.1471	188.9124 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	193.5493	170.6130	179.2235	160.7207	157.5435	140.8321	135.3123	148.3994	148.1122	166.6552	176.1471	188.9124 (64)
Heat gains from water heating, kWh/month	86.1383	76.4039	81.3749	74.5201	74.1663	67.9071	66.7745	71.1259	70.3277	77.1960	79.6493	84.5965 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.2699	17.1154	13.9192	10.5377	7.8770	6.6501	7.1857	9.3403	12.5365	15.9179	18.5786	19.8055 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	207.8536	210.0105	204.5753	193.0043	178.3980	164.6701	155.4991	153.3422	158.7774	170.3484	184.9547	198.6826 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238 (71)
Water heating gains (Table 5)	115.7772	113.6963	109.3749	103.5001	99.6859	94.3154	89.7506	95.5994	97.6774	103.7580	110.6241	113.7050 (72)
Total internal gains	404.1972	402.1185	389.1657	368.3384	347.2574	326.9321	313.7318	319.5782	330.2877	351.3208	375.4538	393.4894 (73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
Northeast			9.9300		11.2829		0.6300		0.7000		0.7700		34.2408 (75)	
East			2.2100		19.6403		0.6300		0.7000		0.7700		13.2651 (76)	
Solar gains			47.5059	95.6475	168.3087	268.5545	353.5944	373.7283	350.9101	284.3482	202.7161	115.9677	59.6238	38.8713 (83)
Total gains			451.7031	497.7660	557.4744	636.8930	700.8518	700.6604	664.6419	603.9264	533.0038	467.2885	435.0776	432.3607 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	60.9220	61.0634	61.2026	61.8651	61.9906	62.5818	62.5818	62.6926	62.3528	61.9906	61.7372	61.4744
alpha	5.0615	5.0709	5.0802	5.1243	5.1327	5.1721	5.1721	5.1795	5.1569	5.1327	5.1158	5.0983
util living area	0.9979	0.9962	0.9900	0.9635	0.8771	0.7035	0.5369	0.6071	0.8666	0.9805	0.9960	0.9984 (86)
MIT	19.7772	19.9019	20.1470	20.4941	20.7940	20.9530	20.9904	20.9827	20.8586	20.4796	20.0726	19.7562 (87)
Th 2	19.9684	19.9705	19.9726	19.9825	19.9843	19.9930	19.9930	19.9946	19.9896	19.9843	19.9806	19.9767 (88)
util rest of house	0.9972	0.9949	0.9864	0.9495	0.8319	0.6134	0.4199	0.4856	0.8000	0.9705	0.9943	0.9978 (89)
MIT 2	18.3389	18.5224	18.8803	19.3828	19.7814	19.9617	19.9894	19.9873	19.8725	19.3708	18.7795	18.3142 (90)
Living area fraction									fLA = Living area / (4) =			0.3631 (91)
MIT	18.8612	19.0233	19.3403	19.7864	20.1491	20.3217	20.3529	20.3488	20.2306	19.7734	19.2491	18.8378 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8612	19.0233	19.3403	19.7864	20.1491	20.3217	20.3529	20.3488	20.2306	19.7734	19.2491	18.8378 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9961	0.9932	0.9833	0.9461	0.8402	0.6445	0.4627	0.5300	0.8182	0.9677	0.9926	0.9969 (94)
Ext temp.	449.9601	494.3727	548.1924	602.5664	588.8599	451.5573	307.5181	320.0987	436.0894	452.2105	431.8665	431.0209 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Month fracti	1238.7209	1198.6906	1087.3151	911.9862	706.3734	473.8339	310.7938	326.4372	509.5610	766.9308	1019.8747	1234.0519 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating	586.8380	473.3016	401.1073	222.7822	87.4300	0.0000	0.0000	0.0000	0.0000	234.1519	423.3660	597.4550 (98)
Space heating per m2												3026.4321 (98)
										(98) / (4) =		40.5525 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3236.8258 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	586.8380	473.3016	401.1073	222.7822	87.4300	0.0000	0.0000	0.0000	0.0000	234.1519	423.3660	597.4550	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	627.6342	506.2049	428.9918	238.2698	93.5081	0.0000	0.0000	0.0000	0.0000	250.4299	452.7978	638.9893	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	193.5493	170.6130	179.2235	160.7207	157.5435	140.8321	135.3123	148.3994	148.1122	166.6552	176.1471	188.9124	(64)
Efficiency of water heater (217)m	87.5873	87.3951	86.9015	85.6851	83.3156	79.8000	79.8000	79.8000	79.8000	85.7208	87.0698	79.8000	(216)
Fuel for water heating, kWh/month	220.9788	195.2204	206.2376	187.5714	189.0924	176.4813	169.5643	185.9642	185.6043	194.4162	202.3057	215.4670	(219)
Water heating fuel used												2328.9035	(219)
Annual totals kWh/year													
Space heating fuel - main system												3236.8258	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												340.3127	(232)
Total delivered energy for all uses												5981.0420	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3236.8258	0.2160	699.1544 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2328.9035	0.2160	503.0431 (264)
Space and water heating			1202.1975 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	340.3127	0.5190	176.6223 (268)
Total CO2, kg/m2/year			1417.7448 (272)
Emissions per m2 for space and water heating			16.1088 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3666 (272b)
Emissions per m2 for pumps and fans			0.5216 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.1088 * 1.00) + 2.3666 + 0.5216, rounded to 2 d.p.			19.0000 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	005	Issued on Date	29/04/2022
Assessment Reference	005	Prop Type Ref	
Property			
SAP Rating	83 B	DER	19.03
Environmental	88 B	TER	20.98
CO ₂ Emissions (t/year)	0.81	% DER<TER	9.31
General Requirements Compliance	Pass	DFEE	46.28
		TFEE	54.78
		% DFEE<TFEE	15.51
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 20.98 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 19.03 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)54.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)46.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing North East:	6.24 m ² , No overhang
Windows facing East:	2.21 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Exposed floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)
Exposed Floor			50.7900	0.1000	5.0790		(28b)
External Wall	19.8500	8.4500	11.4000	0.1500	1.7100		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Total net area of external elements Aum(A, m ²)				88.1400			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.2571		(33)
Party Wall			37.0000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.9558 (36)
Total fabric heat loss							(33) + (36) = 33.2129 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	11.1341	11.0123	10.8905	10.2816	10.1599	9.5510	9.5510	9.4292	9.7945	10.1599	10.4034	10.6470 (38)
Heat transfer coeff	44.3470	44.2252	44.1034	43.4945	43.3727	42.7639	42.7639	42.6421	43.0074	43.3727	43.6163	43.8598 (39)
Average = Sum(39)m / 12 =												43.4641 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8731	0.8707	0.8683	0.8564	0.8540	0.8420	0.8420	0.8396	0.8468	0.8540	0.8588	0.8636 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)

Design SAP
elmhurst energy

Water storage loss:												110.0000	(47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss													
	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(62)
Solar input												0.0000	(63)
												0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000	(63)
Output from w/h													
	177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(64)
Total per year (kWh/year) = Sum(64)m =												1829.1942	(64)
Heat gains from water heating, kWh/month													
	84.8430	75.4698	80.8830	74.7574	74.8902	69.2597	68.7450	72.3625	71.2721	77.4089	79.0216	83.5613	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.4839	11.9763	9.7398	7.3736	5.5119	4.6534	5.0281	6.5357	8.7723	11.1384	13.0002	13.8587 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	114.0363	112.3063	108.7138	103.8297	100.6589	96.1941	92.3992	97.2615	98.9891	104.0442	109.7522	112.3135 (72)
Total internal gains	325.5065	323.8179	314.0852	298.5244	283.0012	267.8182	257.8112	262.6320	270.4999	286.2317	304.2921	317.5716 (73)

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast					6.2400	11.2829	0.4000	0.8000	0.7700	15.6131 (75)
East					2.2100	19.6403	0.4000	0.8000	0.7700	9.6255 (76)
Solar gains	25.2386	50.6105	88.2687	139.2616	181.8285	191.4969	180.0811	146.8995	105.8366	20.6660 (83)
Total gains	350.7451	374.4284	402.3539	437.7860	464.8297	459.3151	437.8922	409.5315	376.3365	338.2376 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nll,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.5338	79.7528	79.9730	81.0926	81.3203	82.4781	82.4781	82.7137	82.0111	81.3203	80.8662	80.4171
alpha	6.3023	6.3169	6.3315	6.4062	6.4214	6.4985	6.4985	6.5142	6.4674	6.4214	6.3911	6.3611
util living area	0.9952	0.9917	0.9796	0.9305	0.7969	0.5874	0.4287	0.4769	0.7453	0.9498	0.9896	0.9962 (86)
MIT	20.2376	20.3363	20.5218	20.7677	20.9356	20.9924	20.9991	20.9983	20.9682	20.7633	20.4653	20.2198 (87)
Th 2	20.1904	20.1924	20.1945	20.2048	20.2068	20.2171	20.2171	20.2192	20.2130	20.2068	20.2027	20.1986 (88)
util rest of house	0.9938	0.9892	0.9731	0.9097	0.7485	0.5192	0.3530	0.3971	0.6764	0.9301	0.9859	0.9950 (89)
MIT 2	19.1747	19.3195	19.5881	19.9374	20.1465	20.2122	20.2168	20.2185	20.1890	19.9391	19.5155	19.1552 (90)
Living area fraction									fLA = Living area / (4) =			0.5021 (91)
MIT	19.7083	19.8300	20.0568	20.3542	20.5427	20.6039	20.6096	20.6100	20.5802	20.3529	19.9924	19.6897 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7083	19.8300	20.0568	20.3542	20.5427	20.6039	20.6096	20.6100	20.5802	20.3529	19.9924	19.6897 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9927	0.9878	0.9718	0.9140	0.7698	0.5533	0.3910	0.4372	0.7097	0.9343	0.9847	0.9940 (94)
Useful gains	348.1730	369.8527	391.0157	400.1424	357.8459	254.1311	171.2287	179.0547	267.1016	324.5798	330.7983	336.2151 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	683.3126	660.2814	597.9030	498.1969	383.5314	256.7493	171.4646	179.5238	278.6969	423.0096	562.3173	679.3768 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	249.3439	195.1681	153.9241	70.5992	19.1100	0.0000	0.0000	0.0000	0.0000	73.2318	166.6937	255.3124 (98)
Space heating												1183.3831 (98)
Space heating per m2												23.2995 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1183.3831 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1242.5523 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1920.6539 (310a)
Electricity used for heat distribution	31.6321 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	238.1302 (332)
Total delivered energy for all uses	3523.3276 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3534.3086	0.2160	763.4106 (367)
Electrical energy for heat distribution	31.6321	0.5190	16.4170 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			779.8277 (373)
Space and water heating			779.8277 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	238.1302	0.5190	123.5896 (379)
Total CO2, kg/year			966.7307 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			19.0300 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		19.0300 ZC1
Total Floor Area	TFA	50.7900
Assumed number of occupants	N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.4175 ZC2
CO2 emissions from cooking, equation (L16)		3.1526 ZC3
Total CO2 emissions		39.6001 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		39.6001 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 20.0000 / (5) = 0.1575 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4075 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
Effective ac	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)
Exposed Floor			50.7900	0.1300	6.6027		(28b)
External Wall	19.8500	8.4500	11.4000	0.1800	2.0520		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Total net area of external elements Aum(A, m ²)			88.1400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.5572		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.0756 (36)
Total fabric heat loss						(33) + (36) =	34.6328 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	24.3480	24.2160	24.0867	23.4794	23.3658	22.8368	22.8368	22.7389	23.0406	23.3658	23.5957	23.8360 (38)
Heat transfer coeff	58.9807	58.8488	58.7195	58.1122	57.9985	57.4696	57.4696	57.3716	57.6733	57.9985	58.2284	58.4687 (39)
Average = Sum(39)m / 12 =												58.1116 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1613	1.1587	1.1561	1.1442	1.1419	1.1315	1.1315	1.1296	1.1355	1.1419	1.1465	1.1512 (40)
HLP (average)												1.1442 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
Heat gains from water heating, kWh/month	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782 (72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W		
Northeast				6.2400	11.2829	0.6300	0.7000	0.7700		21.5169		
East				2.2100	19.6403	0.6300	0.7000	0.7700		13.2651 (75)		

Solar gains	34.7820	69.7476	121.6454	191.9199	250.5825	263.9066	248.1742	202.4459	145.8561	84.3160	43.6138	28.4803 (83)
Total gains	354.2501	387.4940	429.6097	484.2714	527.3697	525.4920	499.7608	458.8865	410.2138	364.4577	341.8569	340.0218 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	59.8006	59.9347	60.0667	60.6944	60.8133	61.3730	61.3730	61.4778	61.1562	60.8133	60.5732	60.3243
alpha	4.9867	4.9956	5.0044	5.0463	5.0542	5.0915	5.0915	5.0985	5.0771	5.0542	5.0382	5.0216
util living area	0.9961	0.9932	0.9836	0.9470	0.8441	0.6614	0.4981	0.5600	0.8225	0.9674	0.9924	0.9968 (86)
MIT	19.8335	19.9613	20.2078	20.5473	20.8255	20.9624	20.9927	20.9872	20.8878	20.5359	20.1302	19.8107 (87)
Th 2	19.9511	19.9532	19.9553	19.9649	19.9667	19.9752	19.9752	19.9767	19.9719	19.9667	19.9631	19.9592 (88)
util rest of house	0.9948	0.9909	0.9778	0.9280	0.7927	0.5710	0.3862	0.4431	0.7465	0.9519	0.9895	0.9958 (89)
MIT 2	18.4086	18.5961	18.9543	19.4400	19.8001	19.9511	19.9726	19.9716	19.8838	19.4343	18.8499	18.3811 (90)
Living area fraction									fLA = Living area / (4) =			0.5021 (91)
MIT	19.1240	19.2815	19.5836	19.9960	20.3149	20.4589	20.4847	20.4815	20.3879	19.9874	19.4927	19.0988 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1240	19.2815	19.5836	19.9960	20.3149	20.4589	20.4847	20.4815	20.3879	19.9874	19.4927	19.0988 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9934	0.9890	0.9752	0.9287	0.8115	0.6152	0.4426	0.5021	0.7800	0.9523	0.9877	0.9946 (94)
Useful gains	351.9111	383.2133	418.9569	449.7246	427.9599	323.2710	221.1971	230.3862	319.9786	347.0818	337.6384	338.1750 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	874.3321	846.3345	768.2652	644.8114	499.6535	336.7061	223.2535	234.1615	362.6424	544.4550	721.6076	871.1157 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	388.6812	311.2174	259.8854	140.4625	53.3401	0.0000	0.0000	0.0000	0.0000	146.8457	276.4578	396.5079 (98)
Space heating												1973.3981 (98)
Space heating per m2										(98) / (4) =		38.8541 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2110.5862 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	388.6812	311.2174	259.8854	140.4625	53.3401	0.0000	0.0000	0.0000	0.0000	146.8457	276.4578	396.5079	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	415.7019	332.8529	277.9523	150.2273	57.0482	0.0000	0.0000	0.0000	0.0000	157.0542	295.6768	424.0726	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	86.9696	86.7358	86.1521	84.7995	82.5077	79.8000	79.8000	79.8000	79.8000	84.8218	86.3567	79.8000	(216)
Fuel for water heating, kWh/month	194.0507	171.7129	182.0679	166.5334	168.2653	156.2471	150.8144	164.4484	163.8315	172.6050	178.3814	189.3981	(219)
Water heating fuel used												2058.3561	(219)
Annual totals kWh/year													
Space heating fuel - main system												2110.5862	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												4487.3187	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2110.5862	0.2160	455.8866 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2058.3561	0.2160	444.6049 (264)
Space and water heating			900.4915 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			1065.7289 (272)
Emissions per m2 for space and water heating			17.7297 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.7297 * 1.00) + 2.4870 + 0.7664, rounded to 2 d.p.			20.9800 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	006			Issued on Date	29/04/2022
Assessment Reference	006	Prop Type Ref			
Property					
SAP Rating	84 B	DER	15.97	TER	17.28
Environmental	88 B	% DER<TER	7.59		
CO ₂ Emissions (t/year)	1.15	DFEE	43.42	TFEE	51.71
General Requirements Compliance	Fail	% DFEE<TFEE	16.02		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 88 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 17.28 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.97 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)51.7 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)43.4 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing North East:	12.71 m ² , No overhang
Windows facing East:	1.37 m ² , No overhang
Windows facing South East:	7.38 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Exposed floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	87.5200 (1b)	x 2.5000 (2b)	= 218.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	218.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			21.4600	1.1450	24.5725		(27)
Exposed Floor			87.5200	0.1000	8.7520		(28b)
External Wall	45.5300	21.4600	24.0700	0.1500	3.6105		(29a)
Corridor	10.9800	1.8900	9.0900	0.2500	2.2725		(29a)
Total net area of external elements Aum(A, m ²)			144.0300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.0975		(33)
Party Wall			39.6000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.3464 (36)
Total fabric heat loss						(33) + (36) =	57.4439 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	20.2216	19.9915	19.7613	18.6106	18.3804	17.2297	17.2297	16.9995	17.6900	18.3804	18.8407	19.3010 (38)
Heat transfer coeff	77.6656	77.4354	77.2053	76.0545	75.8243	74.6736	74.6736	74.4434	75.1339	75.8243	76.2847	76.7450 (39)
Average = Sum(39)m / 12 =												75.9970 (39)
HLP	0.8874	0.8848	0.8821	0.8690	0.8664	0.8532	0.8532	0.8506	0.8585	0.8664	0.8716	0.8769 (40)
HLP (average)												0.8683 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5902 (42)
Average daily hot water use (litres/day)												95.7180 (43)
Daily hot water use	105.2898	101.4611	97.6323	93.8036	89.9749	86.1462	86.1462	89.9749	93.8036	97.6323	101.4611	105.2898 (44)
Energy conte	156.1417	136.5625	140.9203	122.8577	117.8849	101.7257	94.2638	108.1691	109.4610	127.5662	139.2485	151.2149 (45)
Energy content (annual)										Total = Sum(45)m =		1506.0165 (45)
Distribution loss (46)m = 0.15 x (45)m	23.4213	20.4844	21.1380	18.4287	17.6827	15.2589	14.1396	16.2254	16.4192	19.1349	20.8873	22.6822 (46)

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	211.4185	186.4900	196.1971	176.3514	173.1617	155.2194	149.5406	163.4459	162.9547	182.8430	192.7422	206.4917	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
	Solar input (sum of months) = Sum (63)m =												0.0000 (63)
Output from w/h													
	211.4185	186.4900	196.1971	176.3514	173.1617	155.2194	149.5406	163.4459	162.9547	182.8430	192.7422	206.4917	(64)
	Total per year (kWh/year) = Sum (64)m =												2156.8562 (64)
Heat gains from water heating, kWh/month													
	96.1386	85.3490	91.0774	83.6451	83.4182	76.6187	75.5642	80.1877	79.1907	86.6372	89.0951	94.5004	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.9005	18.5637	15.0970	11.4294	8.5436	7.2129	7.7938	10.1306	13.5973	17.2649	20.1507	21.4814 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	234.4405	236.8732	230.7428	217.6917	201.2171	185.7333	175.3892	172.9564	179.0869	192.1379	208.6125	224.0963 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092 (71)
Water heating gains (Table 5)	129.2185	127.0074	122.4159	116.1738	112.1212	106.4149	101.5647	107.7791	109.9871	116.4479	123.7432	127.0167 (72)
Total internal gains	446.4130	444.2978	430.1091	407.1484	383.7354	361.2145	346.6011	352.7196	364.5248	387.7042	414.3599	434.4479 (73)

[Jan]			Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				
Northeast			12.7100	11.2829	0.4000	0.8000	0.7700	31.8018 (75)				
East			1.3700	19.6403	0.4000	0.8000	0.7700	5.9669 (76)				
Southeast			7.3800	36.7938	0.4000	0.8000	0.7700	60.2164 (77)				
Solar gains	97.9851	178.9767	276.1939	393.4643	486.5955	503.0205	476.6833	404.3119	316.4320	206.3224	119.5802	82.4105 (83)
Total gains	544.3980	623.2745	706.3030	800.6127	870.3309	864.2350	823.2844	757.0316	680.9567	594.0265	533.9401	516.8584 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil/m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	78.2558	78.4884	78.7223	79.9135	80.1560	81.3913	81.3913	81.6429	80.8926	80.1560	79.6724	79.1945
alpha	6.2171	6.2326	6.2482	6.3276	6.3437	6.4261	6.4261	6.4429	6.3928	6.3437	6.3115	6.2796
util living area	0.9974	0.9933	0.9785	0.9158	0.7588	0.5474	0.3984	0.4508	0.7246	0.9533	0.9934	0.9981 (86)
MIT	20.1502	20.2923	20.5167	20.7884	20.9494	20.9945	20.9994	20.9987	20.9717	20.7485	20.4010	20.1266 (87)
Th 2	20.1782	20.1805	20.1827	20.1939	20.1962	20.2074	20.2074	20.2097	20.2029	20.1962	20.1917	20.1872 (88)
util rest of house	0.9965	0.9912	0.9717	0.8919	0.7082	0.4821	0.3270	0.3742	0.6548	0.9345	0.9910	0.9975 (89)
MIT 2	19.0382	19.2466	19.5712	19.9540	20.1500	20.2040	20.2072	20.2092	20.1820	19.9103	19.4142	19.0106 (90)
Living area fraction									fLA = Living area / (4) =	0.1862	0.1862	0.1862 (91)
MIT	19.2453	19.4414	19.7473	20.1094	20.2988	20.3513	20.3548	20.3562	20.3291	20.0664	19.5980	19.2184 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2453	19.4414	19.7473	20.1094	20.2988	20.3513	20.3548	20.3562	20.3291	20.0664	19.5980	19.2184 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9952	0.9887	0.9671	0.8891	0.7150	0.4941	0.3403	0.3885	0.6664	0.9309	0.9885	0.9964 (94)
Useful gains	541.7763	616.2013	683.0933	711.8186	622.2570	427.0383	280.1986	294.1037	453.8129	552.9647	527.8013	515.0005 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1160.7324	1126.0183	1022.7628	852.5246	652.0022	429.4669	280.3810	294.5148	468.0130	717.7857	953.4063	1152.5882 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	460.5033	342.5970	252.7141	101.3083	22.1305	0.0000	0.0000	0.0000	0.0000	122.6268	306.4356	474.3652 (98)
Space heating												2082.6809 (98)
Space heating per m2												23.7966 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	2082.6809	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	2186.8150	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating:		
Annual water heating requirement	2156.8562	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2264.6990	(310a)
Electricity used for heat distribution	44.5151	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	210.2121	(330a)
Total electricity for the above, kWh/year	210.2121	(331)
Electricity for lighting (calculated in Appendix L)	369.1100	(332)
Total delivered energy for all uses	5030.8362	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	4973.7587	0.2160	1074.3319 (367)
Electrical energy for heat distribution	44.5151	0.5190	23.1034 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1097.4352 (373)
Space and water heating			1097.4352 (376)
Pumps and fans	210.2121	0.5190	109.1001 (378)
Energy for lighting	369.1100	0.5190	191.5681 (379)
Total CO2, kg/year			1398.1034 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.9700 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		15.9700	ZC1
Total Floor Area	TFA	87.5200	
Assumed number of occupants	N	2.5902	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		15.8735	ZC2
CO2 emissions from cooking, equation (L16)		2.0700	ZC3
Total CO2 emissions		33.9134	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		33.9134	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	87.5200 (1b)	x 2.5000 (2b)	= 218.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 218.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 30.0000 / (5) = 0.1371 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3871 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3290 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4195	0.4113	0.4031	0.3619	0.3537	0.3126	0.3126	0.3044	0.3290	0.3537	0.3702	0.3866 (22b)
Effective ac	0.5880	0.5846	0.5812	0.5655	0.5626	0.5489	0.5489	0.5463	0.5541	0.5626	0.5685	0.5747 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			20.0000	1.3258	26.5152		(27)
Exposed Floor			87.5200	0.1300	11.3776		(28b)
External Wall	45.5300	20.0000	25.5300	0.1800	4.5954		(29a)
Corridor	10.9800	1.8900	9.0900	0.1800	1.6362		(29a)
Total net area of external elements Aum(A, m ²)			144.0300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.0144		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.7834 (36)
Total fabric heat loss						(33) + (36) =	60.7978 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	42.4562	42.2095	41.9676	40.8316	40.6191	39.6297	39.6297	39.4465	40.0108	40.6191	41.0491	41.4986 (38)
Heat transfer coeff	103.2540	103.0072	102.7654	101.6294	101.4168	100.4274	100.4274	100.2442	100.8085	101.4168	101.8468	102.2963 (39)
Average = Sum(39)m / 12 =												101.6284 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1798	1.1770	1.1742	1.1612	1.1588	1.1475	1.1475	1.1454	1.1518	1.1588	1.1637	1.1688 (40)
HLP (average)												1.1612 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5902 (42)
Average daily hot water use (litres/day)												95.7180 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	105.2898	101.4611	97.6323	93.8036	89.9749	86.1462	86.1462	89.9749	93.8036	97.6323	101.4611	105.2898 (44)
Energy conte	156.1417	136.5625	140.9203	122.8577	117.8849	101.7257	94.2638	108.1691	109.4610	127.5662	139.2485	151.2149 (45)
Energy content (annual)										Total = Sum(45)m =		1506.0165 (45)
Distribution loss (46)m = 0.15 x (45)m	23.4213	20.4844	21.1380	18.4287	17.6827	15.2589	14.1396	16.2254	16.4192	19.1349	20.8873	22.6822 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	202.7366	178.6482	187.5152	167.9496	164.4798	146.8176	140.8587	154.7640	154.5528	174.1611	184.3404	197.8098 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	202.7366	178.6482	187.5152	167.9496	164.4798	146.8176	140.8587	154.7640	154.5528	174.1611	184.3404	197.8098 (64)
Heat gains from water heating, kWh/month	89.1930	79.0756	84.1319	76.9237	76.4727	69.8973	68.6186	73.2422	72.4693	79.6917	82.3736	87.5549 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115 (66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.9005	18.5637	15.0970	11.4294	8.5436	7.2129	7.7938	10.1306	13.5973	17.2649	20.1507	21.4814 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	234.4405	236.8732	230.7428	217.6917	201.2171	185.7333	175.3892	172.9564	179.0869	192.1379	208.6125	224.0963 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512 (69)	
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)	
Losses e.g. evaporation (negative values) (Table 5)	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092 (71)	
Water heating gains (Table 5)	119.8831	117.6720	113.0805	106.8384	102.7858	97.0795	92.2294	98.4438	100.6517	107.1125	114.4078	117.6813 (72)	
Total internal gains	440.0776	437.9624	423.7737	400.8130	377.4000	354.8792	340.2657	346.3842	358.1894	381.3688	408.0245	428.1125 (73)	

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W		
Northeast					11.8500	11.2829	0.6300	0.7000			0.7700			40.8613 (75)		
East					1.2800	19.6403	0.6300	0.7000			0.7700			7.6830 (76)		
Southeast					6.8700	36.7938	0.6300	0.7000			0.7700			77.2509 (77)		
Solar gains					125.7952	229.7908	354.6482	505.2835	624.9212	646.0304	612.1995	519.2294	406.3346	264.9111	153.5227	105.7982 (83)
Total gains					565.8728	667.7532	778.4220	906.0965	1002.3212	1000.9095	952.4653	865.6137	764.5240	646.2798	561.5471	533.9107 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.8624	59.0034	59.1423	59.8034	59.9287	60.5191	60.5191	60.6297	60.2903	59.9287	59.6757	59.4135	
alpha	4.9242	4.9336	4.9428	4.9869	4.9952	5.0346	5.0346	5.0420	5.0194	4.9952	4.9784	4.9609	
util living area	0.9972	0.9933	0.9803	0.9316	0.8069	0.6156	0.4587	0.5221	0.7921	0.9646	0.9939	0.9979 (86)	
MIT	19.7619	19.9373	20.2233	20.5871	20.8560	20.9715	20.9946	20.9901	20.9035	20.5379	20.0821	19.7319 (87)	
Th 2	19.9362	19.9385	19.9407	19.9512	19.9531	19.9622	19.9622	19.9639	19.9587	19.9531	19.9492	19.9450 (88)	
util rest of house	0.9963	0.9910	0.9735	0.9085	0.7503	0.5268	0.3533	0.4099	0.7115	0.9479	0.9915	0.9972 (89)	
MIT 2	18.2937	18.5507	18.9651	19.4807	19.8198	19.9446	19.9604	19.9601	19.8854	19.4260	18.7704	18.2562 (90)	
Living area fraction	18.5671	18.8089	19.1994	19.6867	20.0128	20.1358	20.1530	20.1519	20.0750	19.6330	19.0147	18.5310 (92)	
Temperature adjustment	18.5671	18.8089	19.1994	19.6867	20.0128	20.1358	20.1530	20.1519	20.0750	19.6330	19.0147	18.5310 (93)	
adjusted MIT	18.5671	18.8089	19.1994	19.6867	20.0128	20.1358	20.1530	20.1519	20.0750	19.6330	19.0147	18.5310 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9944	0.9875	0.9671	0.9014	0.7539	0.5423	0.3730	0.4308	0.7216	0.9412	0.9883	0.9958 (94)	
Ext temp.	562.7279	659.4144	752.8082	816.7562	755.6422	542.7656	355.2238	372.9091	551.6623	608.2702	554.9716	531.6426 (95)	
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Month fracti	1473.1384	1432.7202	1305.0632	1096.2481	843.0595	555.9482	356.8197	376.1105	602.3352	916.1024	1213.4716	1466.0089 (97)	
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)	
Space heating per m2	677.3454	519.6615	410.8777	201.2342	65.0384	0.0000	0.0000	0.0000	0.0000	229.0271	474.1200	695.1685 (98)	
												3272.4729 (98)	
												37.3911 (99)	

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3499.9710 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	677.3454	519.6615	410.8777	201.2342	65.0384	0.0000	0.0000	0.0000	0.0000	229.0271	474.1200	695.1685	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	724.4336	555.7877	439.4414	215.2237	69.5598	0.0000	0.0000	0.0000	0.0000	244.9488	507.0802	743.4957	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	202.7366	178.6482	187.5152	167.9496	164.4798	146.8176	140.8587	154.7640	154.5528	174.1611	184.3404	197.8098	(64)
Efficiency of water heater (217)m	87.7884	87.4985	86.8507	85.2970	82.5662	79.8000	79.8000	79.8000	79.8000	85.5453	87.2257	87.8895	(216)
Fuel for water heating, kWh/month	230.9378	204.1728	215.9051	196.8997	199.2095	183.9819	176.5147	193.9399	193.6752	203.5895	211.3372	225.0665	(219)
Water heating fuel used												2435.2298	(219)
Annual totals kWh/year													
Space heating fuel - main system												3499.9710	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												369.1100	(232)
Total delivered energy for all uses												6379.3108	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3499.9710	0.2160	755.9937 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2435.2298	0.2160	526.0096 (264)
Space and water heating			1282.0034 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	369.1100	0.5190	191.5681 (268)
Total CO2, kg/m2/year			1512.4965 (272)
Emissions per m2 for space and water heating			14.6481 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.1888 (272b)
Emissions per m2 for pumps and fans			0.4448 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.6481 * 1.00) + 2.1888 + 0.4448, rounded to 2 d.p.			17.2800 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	007	Issued on Date	29/04/2022
Assessment Reference	007	Prop Type Ref	
Property			
SAP Rating	84 B	DER	15.91
Environmental	88 B	TER	16.94
CO ₂ Emissions (t/year)	1.13	% DER<TER	6.10
General Requirements Compliance	Pass	DFEE	42.64
		TFEE	48.65
		% DFEE<TFEE	12.35
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 87 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 16.94 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.91 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)48.7 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)42.6 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing South East:	1.97 m ² , No overhang
Windows facing South:	3.92 m ² , No overhang
Windows facing South West:	8.41 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Exposed floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	87.0000 (1b)	x 2.5000 (2b)	= 217.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 217.5000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			14.3000	1.1450	16.3740		(27)
Exposed Floor			87.0000	0.1000	8.7000		(28b)
External Wall	44.9800	14.3000	30.6800	0.1500	4.6020		(29a)
Corridor	15.5500	1.8900	13.6600	0.2500	3.4150		(29a)
Core	18.2300		18.2300	0.2500	4.5575		(29a)
Total net area of external elements Aum(A, m2)			165.7600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.5385		(33)
Party Wall			18.8500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							17.8744 (36)
Total fabric heat loss						(33) + (36) =	57.4129 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	20.1015	19.8727	19.6439	18.5000	18.2712	17.1273	17.1273	16.8985	17.5849	18.2712	18.7288	19.1864 (38)
Heat transfer coeff	77.5144	77.2856	77.0569	75.9130	75.6842	74.5403	74.5403	74.3115	74.9978	75.6842	76.1417	76.5993 (39)
Average = Sum(39)m / 12 =												75.8558 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8910	0.8883	0.8857	0.8726	0.8699	0.8568	0.8568	0.8542	0.8620	0.8699	0.8752	0.8805 (40)
HLP (average)												0.8719 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5824 (42)
Average daily hot water use (litres/day)												95.5318 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	105.0850	101.2637	97.4424	93.6211	89.7999	85.9786	85.9786	89.7999	93.6211	97.4424	101.2637	105.0850 (44)
Energy conte	155.8380	136.2969	140.6462	122.6187	117.6556	101.5278	94.0805	107.9587	109.2481	127.3181	138.9777	150.9207 (45)
Energy content (annual)												Total = Sum(45)m = 1503.0869 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	23.3757	20.4445	21.0969	18.3928	17.6483	15.2292	14.1121	16.1938	16.3872	19.0977	20.8466	22.6381 (46)
Water storage loss:												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
211.1148	186.2243	195.9230	176.1124	172.9324	155.0215	149.3573	163.2355	162.7418	182.5949	192.4713	206.1975	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
211.1148	186.2243	195.9230	176.1124	172.9324	155.0215	149.3573	163.2355	162.7418	182.5949	192.4713	206.1975	(64)
Heat gains from water heating, kWh/month												
96.0376	85.2607	90.9863	83.5657	83.3419	76.5529	75.5032	80.1177	79.1199	86.5547	89.0050	94.4026	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
21.1208	18.7593	15.2561	11.5499	8.6337	7.2889	7.8759	10.2374	13.7406	17.4469	20.3631	21.7078	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
233.4490	235.8715	229.7669	216.7711	200.3661	184.9478	174.6474	172.2249	178.3295	191.3253	207.7303	223.1486	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	(71)
Water heating gains (Table 5)												
129.0827	126.8760	122.2934	116.0634	112.0187	106.3235	101.4828	107.6851	109.8888	116.3370	123.6181	126.8852	(72)
Total internal gains												
445.3884	443.2426	429.0523	406.1202	382.7544	360.2961	345.7420	351.8833	363.6948	386.8451	413.4473	433.4775	(73)

6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains
		m2	Table 6a	Specific data	Specific data	factor	W
			W/m2	or Table 6b	or Table 6c	Table 6d	
Southeast		1.9700	36.7938	0.4000	0.8000	0.7700	16.0740 (77)
South		3.9200	46.7521	0.4000	0.8000	0.7700	40.6415 (78)
Southwest		8.4100	36.7938	0.4000	0.8000	0.7700	68.6206 (79)

Solar gains	125.3361	210.8266	282.1774	340.4041	373.8044	368.0651	356.0989	331.4779	302.3021	231.2365	149.6187	107.5989 (83)
Total gains	570.7245	654.0692	711.2297	746.5243	756.5588	728.3612	701.8409	683.3612	665.9969	618.0815	563.0660	541.0764 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	77.9425	78.1732	78.4053	79.5868	79.8273	81.0524	81.0524	81.3019	80.5579	79.8273	79.3476	78.8737
alpha	6.1962	6.2115	6.2270	6.3058	6.3218	6.4035	6.4035	6.4201	6.3705	6.3218	6.2898	6.2582
util living area	0.9965	0.9912	0.9773	0.9351	0.8304	0.6392	0.4654	0.4973	0.7359	0.9439	0.9911	0.9974 (86)
MIT	20.1777	20.3244	20.5212	20.7493	20.9139	20.9869	20.9985	20.9977	20.9688	20.7682	20.4314	20.1518 (87)
Th 2	20.1752	20.1774	20.1797	20.1909	20.1931	20.2044	20.2044	20.2066	20.1999	20.1931	20.1886	20.1841 (88)
util rest of house												
	0.9954	0.9885	0.9702	0.9150	0.7842	0.5665	0.3823	0.4131	0.6659	0.9224	0.9878	0.9966 (89)
MIT 2	19.0759	19.2905	19.5749	19.9011	20.1106	20.1958	20.2038	20.2057	20.1766	19.9333	19.4557	19.0450 (90)
Living area fraction									fLA = Living area / (4) =			0.1782 (91)
MIT	19.2722	19.4747	19.7435	20.0522	20.2537	20.3367	20.3454	20.3468	20.3177	20.0821	19.6295	19.2422 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2722	19.4747	19.7435	20.0522	20.2537	20.3367	20.3454	20.3468	20.3177	20.0821	19.6295	19.2422 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9937	0.9854	0.9655	0.9110	0.7879	0.5789	0.3971	0.4281	0.6768	0.9188	0.9848	0.9953 (94)
Useful gains	567.1336	644.5084	686.6652	680.1143	596.1282	421.6702	278.7216	292.5568	450.7547	567.9191	554.5120	538.5341 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
	1160.5630	1126.4179	1020.5024	846.5973	647.3834	427.6178	279.1813	293.2916	466.3152	717.6428	954.0188	1152.2199 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
	441.5115	323.8432	248.3749	119.8678	38.1339	0.0000	0.0000	0.0000	0.0000	111.3944	287.6449	456.5822 (98)
Space heating												2027.3527 (98)
Space heating per m2												23.3029 (99)
										(98) / (4) =		

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8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	2027.3527 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	2128.7204 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2153.9267 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2261.6230 (310a)
Electricity used for heat distribution	43.9034 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	208.9631 (330a)
Total electricity for the above, kWh/year	208.9631 (331)
Electricity for lighting (calculated in Appendix L)	373.0005 (332)
Total delivered energy for all uses	4972.3070 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	4905.4116	0.2160	1059.5689 (367)
Electrical energy for heat distribution	43.9034	0.5190	22.7859 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1082.3548 (373)
Space and water heating			1082.3548 (376)
Pumps and fans	208.9631	0.5190	108.4519 (378)
Energy for lighting	373.0005	0.5190	193.5872 (379)
Total CO2, kg/year			1384.3939 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.9100 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER	15.9100 ZC1
Total Floor Area	87.0000
Assumed number of occupants	N 2.5824
CO2 emission factor in Table 12 for electricity displaced from grid	EF 0.5190
CO2 emissions from appliances, equation (L14)	15.9008 ZC2
CO2 emissions from cooking, equation (L16)	2.0802 ZC3
Total CO2 emissions	33.8910 ZC4
Residual CO2 emissions offset from biofuel CHP	0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year	0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000 ZC7
Net CO2 emissions	33.8910 ZC8

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	87.0000 (1b)	x 2.5000 (2b)	= 217.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 217.5000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1379 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3879 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3297 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4204	0.4122	0.4039	0.3627	0.3545	0.3133	0.3133	0.3050	0.3297	0.3545	0.3710	0.3874 (22b)
	0.5884	0.5849	0.5816	0.5658	0.5628	0.5491	0.5491	0.5465	0.5544	0.5628	0.5688	0.5751 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			14.3000	1.3258	18.9583			(27)					
Exposed Floor			87.0000	0.1300	11.3100			(28b)					
External Wall	44.9800	14.3000	30.6800	0.1800	5.5224			(29a)					
Corridor	15.5500	1.8900	13.6600	0.1800	2.4588			(29a)					
Core	18.2300		18.2300	0.1800	3.2814			(29a)					
Total net area of external elements Aum(A, m2)			165.7600					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.4209			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								16.3974 (36)					
Total fabric heat loss						(33) + (36) =		59.8183 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 42.2307	Feb 41.9844	Mar 41.7430	Apr 40.6090	May 40.3968	Jun 39.4091	Jul 39.4091	Aug 39.2262	Sep 39.7895	Oct 40.3968	Nov 40.8260	Dec 41.2747	(38)
Heat transfer coeff	102.0491	101.8027	101.5613	100.4273	100.2151	99.2274	99.2274	99.0445	99.6079	100.2151	100.6443	101.0931	(39)
Average = Sum(39)m / 12 =												100.4263	(39)
HLP	Jan 1.1730	Feb 1.1701	Mar 1.1674	Apr 1.1543	May 1.1519	Jun 1.1405	Jul 1.1405	Aug 1.1384	Sep 1.1449	Oct 1.1519	Nov 1.1568	Dec 1.1620	(40)
HLP (average)												1.1543	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5824 (42)
Average daily hot water use (litres/day)												95.5318 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	105.0850	101.2637	97.4424	93.6211	89.7999	85.9786	85.9786	89.7999	93.6211	97.4424	101.2637	105.0850 (44)
Energy conte	155.8380	136.2969	140.6462	122.6187	117.6556	101.5278	94.0805	107.9587	109.2481	127.3181	138.9777	150.9207 (45)
Energy content (annual)											Total = Sum(45)m =	1503.0869 (45)
Distribution loss	(46)m = 0.15 x (45)m											
	23.3757	20.4445	21.0969	18.3928	17.6483	15.2292	14.1121	16.1938	16.3872	19.0977	20.8466	22.6381 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

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Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	202.4329	178.3826	187.2411	167.7106	164.2505	146.6197	140.6754	154.5536	154.3399	173.9130	184.0695	197.5156 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	202.4329	178.3826	187.2411	167.7106	164.2505	146.6197	140.6754	154.5536	154.3399	173.9130	184.0695	197.5156 (64)
Heat gains from water heating, kWh/month	89.0920	78.9873	84.0408	76.8442	76.3964	69.8315	68.5577	73.1722	72.3985	79.6092	82.2835	87.4571 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)m
(66)m	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.5997	19.1847	15.6020	11.8117	8.8294	7.4542	8.0545	10.4695	14.0522	17.8425	20.8248	22.2000	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	233.4490	235.8715	229.7669	216.7711	200.3661	184.9478	174.6474	172.2249	178.3295	191.3253	207.7303	223.1486	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	(71)
Water heating gains (Table 5)	119.7474	117.5406	112.9580	106.7281	102.6833	96.9882	92.1474	98.3497	100.5534	107.0016	114.2827	117.5498	(72)
Total internal gains	439.5320	437.3326	423.0628	400.0467	376.6147	354.1260	339.5852	345.7801	357.6709	380.9053	407.5736	427.6343	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	

Southeast					1.9700	36.7938		0.6300	0.7000	0.7700		22.1520 (77)	
South					3.9200	46.7521		0.6300	0.7000	0.7700		56.0091 (78)	
Southwest					8.4100	36.7938		0.6300	0.7000	0.7700		94.5677 (79)	

Solar gains	172.7288	290.5453	388.8757	469.1194	515.1492	507.2397	490.7488	456.8180	416.6101	318.6728	206.1932	148.2848	(83)
Total gains	612.2608	727.8780	811.9386	869.1661	891.7639	861.3657	830.3340	802.5980	774.2810	699.5780	613.7669	575.9191	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	59.2035	59.3468	59.4879	60.1596	60.2870	60.8871	60.8871	60.9995	60.6545	60.2870	60.0299	59.7634
alpha	4.9469	4.9565	4.9659	5.0106	5.0191	5.0591	5.0591	5.0666	5.0436	5.0191	5.0020	4.9842
util living area	0.9959	0.9900	0.9760	0.9387	0.8517	0.6881	0.5160	0.5533	0.7812	0.9511	0.9908	0.9970 (86)
MIT	19.8235	20.0122	20.2680	20.5693	20.8139	20.9542	20.9912	20.9875	20.9109	20.5933	20.1474	19.7891 (87)
Th 2	19.9417	19.9440	19.9462	19.9567	19.9587	19.9679	19.9679	19.9696	19.9643	19.9587	19.9547	19.9505 (88)
util rest of house	0.9946	0.9867	0.9679	0.9174	0.8013	0.5964	0.4001	0.4366	0.6997	0.9296	0.9872	0.9960 (89)
MIT 2	18.3872	18.6627	19.0325	19.4621	19.7799	19.9379	19.9647	19.9646	19.8973	19.5042	18.8686	18.3434 (90)
Living area fraction									fLA = Living area / (4) =			0.1782 (91)
MIT	18.6431	18.9032	19.2526	19.6594	19.9641	20.1190	20.1476	20.1468	20.0779	19.6982	19.0964	18.6010 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6431	18.9032	19.2526	19.6594	19.9641	20.1190	20.1476	20.1468	20.0779	19.6982	19.0964	18.6010 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	607.4568	714.9120	780.1769	790.8869	714.8180	526.0774	349.3609	367.0616	549.4734	645.5323	603.3571	572.4838	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1463.7021	1425.5594	1295.1704	1080.5374	828.1912	547.6354	352.0151	371.1045	595.4456	911.7799	1207.3686	1455.8416	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	637.0465	477.5551	383.1552	208.5483	84.3496	0.0000	0.0000	0.0000	0.0000	198.0882	434.8883	657.2183	(98)
Space heating													(98)
Space heating per m2													(98) / (4) =

8c. Space cooling requirement

Not applicable

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9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												3295.0262 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	637.0465	477.5551	383.1552	208.5483	84.3496	0.0000	0.0000	0.0000	0.0000	198.0882	434.8883	657.2183 (98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000 (210)
Space heating fuel (main heating system)	681.3332	510.7541	409.7916	223.0463	90.2135	0.0000	0.0000	0.0000	0.0000	211.8590	465.1212	702.9072 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	202.4329	178.3826	187.2411	167.7106	164.2505	146.6197	140.6754	154.5536	154.3399	173.9130	184.0695	197.5156 (64)
Efficiency of water heater (217)m	87.6655	87.3161	86.6845	85.3962	83.1350	79.8000	79.8000	79.8000	79.8000	85.1616	87.0297	79.8000 (216)
Fuel for water heating, kWh/month	230.9152	204.2953	216.0028	196.3911	197.5707	183.7339	176.2849	193.6762	193.4084	204.2153	211.5020	225.0118 (219)
Water heating fuel used												2433.0077 (219)
Annual totals kWh/year												
Space heating fuel - main system												3295.0262 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												381.4579 (232)
Total delivered energy for all uses												6184.4918 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3295.0262	0.2160	711.7257 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2433.0077	0.2160	525.5297 (264)
Space and water heating			1237.2553 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	381.4579	0.5190	197.9766 (268)
Total CO2, kg/m2/year			1474.1570 (272)
Emissions per m2 for space and water heating			14.2213 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2756 (272b)
Emissions per m2 for pumps and fans			0.4474 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.2213 * 1.00) + 2.2756 + 0.4474, rounded to 2 d.p.			16.9400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	008	Issued on Date	29/04/2022
Assessment Reference	008	Prop Type Ref	
Property			
SAP Rating	85 B	DER	14.49
Environmental	89 B	TER	15.44
CO ₂ Emissions (t/year)	0.89	% DER<TER	6.14
General Requirements Compliance	Pass	DFEE	34.51
		TFEE	36.09
		% DFEE<TFEE	4.38
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 15.44 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.49 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)36.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)34.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.23 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading: Average
Windows facing South West: 12.10 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Exposed floor U-value 0.10 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.1200 (1b)	x 2.5000 (2b)	= 182.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 182.8000 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							3	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.7750 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1163 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			12.1000	1.1450	13.8550		(27)					
Exposed Floor			4.2300	0.1000	0.4230		(28b)					
External Wall	25.1000	12.1000	13.0000	0.1500	1.9500		(29a)					
Corridor	25.1000	1.8900	23.2100	0.2500	5.8025		(29a)					
Core	18.2300		18.2300	0.2500	4.5575		(29a)					
Total net area of external elements Aum(A, m2)			72.6600				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		28.4780		(33)					
Party Wall			18.2300	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1496 (36)					
Total fabric heat loss						(33) + (36) =	37.6276 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 16.0292	Feb 15.8539	Mar 15.6786	Apr 14.8020	May 14.6267	Jun 13.7501	Jul 13.7501	Aug 13.5748	Sep 14.1007	Oct 14.6267	Nov 14.9773	Dec 15.3280 (38)
Heat transfer coeff	53.6568	53.4815	53.3061	52.4296	52.2542	51.3777	51.3777	51.2023	51.7283	52.2542	52.6049	52.9555 (39)
Average = Sum(39)m / 12 =												52.3857 (39)
HLP	Jan 0.7338	Feb 0.7314	Mar 0.7290	Apr 0.7170	May 0.7146	Jun 0.7026	Jul 0.7026	Aug 0.7003	Sep 0.7074	Oct 0.7146	Nov 0.7194	Dec 0.7242 (40)
HLP (average)												0.7164 (40)
Days in month												
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3194 (42)
Average daily hot water use (litres/day)												89.2864 (43)
Daily hot water use	Jan 98.2150	Feb 94.6436	Mar 91.0721	Apr 87.5007	May 83.9292	Jun 80.3578	Jul 80.3578	Aug 83.9292	Sep 87.5007	Oct 91.0721	Nov 94.6436	Dec 98.2150 (44)
Energy conte	145.6501	127.3865	131.4514	114.6025	109.9639	94.8905	87.9300	100.9009	102.1060	118.9947	129.8920	141.0543 (45)
Energy content (annual)												Total = Sum(45)m = 1404.8227 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	21.8475	19.1080	19.7177	17.1904	16.4946	14.2336	13.1895	15.1351	15.3159	17.8492	19.4838	21.1581 (46)
Water storage loss:												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
200.9269	177.3139	186.7282	168.0962	165.2407	148.3841	143.2068	156.1777	155.5997	174.2715	183.3857	196.3311	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
200.9269	177.3139	186.7282	168.0962	165.2407	148.3841	143.2068	156.1777	155.5997	174.2715	183.3857	196.3311	(64)
Heat gains from water heating, kWh/month												
92.6501	82.2979	87.9290	80.9003	80.7844	74.3460	73.4582	77.7710	76.7452	83.7872	85.9840	91.1220	(65)
Total per year (kWh/year) = Sum(64)m =												2055.6625 (64)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
18.4814	16.4151	13.3496	10.1065	7.5547	6.3780	6.8917	8.9581	12.0235	15.2666	17.8184	18.9951	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
204.4667	206.5884	201.2418	189.8593	175.4910	161.9869	152.9652	150.8435	156.1902	167.5726	181.9409	195.4451	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	(71)
Water heating gains (Table 5)												
124.5297	122.4672	118.1842	112.3615	108.5812	103.2584	98.7341	104.5309	106.5905	112.6172	119.4223	122.4758	(72)
Total internal gains												
405.2693	403.2621	390.5670	370.1188	349.4184	329.4147	316.3824	322.1239	332.5957	353.2478	376.9730	394.7074	(73)

6. Solar gains

[Jan]												
	Area	Solar flux	g	Specific data	FF	Access	Gains					
	m2	Table 6a	W/m2	or Table 6b	Specific data	factor	W					
					or Table 6c	Table 6d						
Southwest	12.1000	36.7938	0.4000		0.8000	0.7700	98.7287	(79)				
Solar gains	98.7287	168.1716	230.0997	285.1047	319.3410	317.0317	305.6524	280.1105	249.1493	185.8654	118.2543	84.4912 (83)
Total gains	503.9980	571.4337	620.6667	655.2234	668.7594	646.4463	622.0348	602.2345	581.7449	539.1133	495.2273	479.1986 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	94.6344	94.9446	95.2569	96.8495	97.1745	98.8324	98.8324	99.1708	98.1625	97.1745	96.5267	95.8876
alpha	7.3090	7.3296	7.3505	7.4566	7.4783	7.5888	7.5888	7.6114	7.5442	7.4783	7.4351	7.3925
util living area	0.9934	0.9828	0.9532	0.8670	0.7071	0.5072	0.3633	0.3909	0.6075	0.8855	0.9815	0.9952 (86)
MIT	20.4505	20.5836	20.7478	20.9075	20.9818	20.9987	20.9999	20.9998	20.9951	20.9079	20.6583	20.4253 (87)
Th 2	20.3111	20.3132	20.3153	20.3258	20.3279	20.3385	20.3385	20.3406	20.3343	20.3279	20.3237	20.3195 (88)
util rest of house	0.9915	0.9780	0.9412	0.8387	0.6622	0.4554	0.3088	0.3350	0.5514	0.8545	0.9756	0.9938 (89)
MIT 2	19.5795	19.7726	20.0050	20.2246	20.3116	20.3376	20.3385	20.3405	20.3308	20.2306	19.8899	19.5499 (90)
Living area fraction									fLA = Living area / (4) =			0.3747 (91)
MIT	19.9059	20.0765	20.2834	20.4805	20.5627	20.5853	20.5863	20.5876	20.5797	20.4844	20.1779	19.8779 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9059	20.0765	20.2834	20.4805	20.5627	20.5853	20.5863	20.5876	20.5797	20.4844	20.1779	19.8779 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9901	0.9761	0.9405	0.8456	0.6782	0.4748	0.3292	0.3559	0.5723	0.8623	0.9741	0.9927 (94)
Useful gains	499.0165	557.7845	583.7670	554.0280	453.5690	306.9382	204.7779	214.3617	332.9470	464.8799	482.3805	475.6788 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
	837.3631	811.6629	734.7376	607.1629	463.1157	307.5130	204.8078	214.4150	335.1855	516.5015	687.9601	830.2317 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
	251.7298	170.6063	112.3221	38.2572	7.1027	0.0000	0.0000	0.0000	0.0000	38.4064	148.0173	263.7873 (98)
Space heating												1030.2292 (98)
Space heating per m2											(98) / (4) =	14.0896 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1030.2292 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1081.7406 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2055.6625 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2158.4456 (310a)
Electricity used for heat distribution	32.4019 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	175.6251 (330a)
Total electricity for the above, kWh/year	175.6251 (331)
Electricity for lighting (calculated in Appendix L)	326.3881 (332)
Total delivered energy for all uses	3742.1994 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3620.3198	0.2160	781.9891 (367)
Electrical energy for heat distribution	32.4019	0.5190	16.8166 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			798.8056 (373)
Space and water heating			798.8056 (376)
Pumps and fans	175.6251	0.5190	91.1494 (378)
Energy for lighting	326.3881	0.5190	169.3954 (379)
Total CO2, kg/year			1059.3505 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.4900 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		14.4900 ZC1
Total Floor Area	TFA	73.1200
Assumed number of occupants	N	2.3194
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.5704 ZC2
CO2 emissions from cooking, equation (L16)		2.3888 ZC3
Total CO2 emissions		33.4491 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		33.4491 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.1200 (1b)	x 2.5000 (2b)	= 182.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 182.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1641 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4141 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3209 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4092	0.4012	0.3931	0.3530	0.3450	0.3049	0.3049	0.2969	0.3209	0.3450	0.3611	0.3771 (22b)
Effective ac	0.5837	0.5805	0.5773	0.5623	0.5595	0.5465	0.5465	0.5441	0.5515	0.5595	0.5652	0.5711 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			12.1000	1.3258	16.0417			(27)					
Exposed Floor			4.2300	0.1300	0.5499			(28b)					
External Wall	25.1000	12.1000	13.0000	0.1800	2.3400			(29a)					
Corridor	25.1000	1.8900	23.2100	0.1800	4.1778			(29a)					
Core	18.2300		18.2300	0.1800	3.2814			(29a)					
Total net area of external elements Aum(A, m2)			72.6600					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =			28.2808		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K									250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)									7.1699 (36)				
Total fabric heat loss						(33) + (36) =	35.4507	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 35.2124	Feb 35.0163	Mar 34.8240	Apr 33.9211	May 33.7522	Jun 32.9658	Jul 32.9658	Aug 32.8202	Sep 33.2687	Oct 33.7522	Nov 34.0939	Dec 34.4512	(38)
Heat transfer coeff	70.6630	70.4669	70.2747	69.3718	69.2029	68.4165	68.4165	68.2709	68.7194	69.2029	69.5446	69.9019	(39)
Average = Sum(39)m / 12 =												69.3710	(39)
HLP	Jan 0.9664	Feb 0.9637	Mar 0.9611	Apr 0.9487	May 0.9464	Jun 0.9357	Jul 0.9357	Aug 0.9337	Sep 0.9398	Oct 0.9464	Nov 0.9511	Dec 0.9560	(40)
HLP (average)												0.9487	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3194 (42)
Average daily hot water use (litres/day)												89.2864 (43)
Daily hot water use	98.2150	94.6436	91.0721	87.5007	83.9292	80.3578	80.3578	83.9292	87.5007	91.0721	94.6436	98.2150 (44)
Energy conte	145.6501	127.3865	131.4514	114.6025	109.9639	94.8905	87.9300	100.9009	102.1060	118.9947	129.8920	141.0543 (45)
Energy content (annual)										Total = Sum(45)m =		1404.8227 (45)
Distribution loss (46)m = 0.15 x (45)m												
21.8475	19.1080	19.7177	17.1904	16.4946	14.2336	13.1895	15.1351	15.3159	17.8492	19.4838	21.1581	(46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	192.2450	169.4722	178.0463	159.6944	156.5588	139.9823	134.5249	147.4958	147.1978	165.5896	174.9838	187.6492 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	192.2450	169.4722	178.0463	159.6944	156.5588	139.9823	134.5249	147.4958	147.1978	165.5896	174.9838	187.6492 (64)
Heat gains from water heating, kWh/month	85.7046	76.0246	80.9835	74.1788	73.8389	67.6245	66.5126	70.8255	70.0237	76.8417	79.2626	84.1765 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.8939	16.7814	13.6476	10.3321	7.7234	6.5204	7.0455	9.1580	12.2919	15.6074	18.2161	19.4191	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.4667	206.5884	201.2418	189.8593	175.4910	161.9869	152.9652	150.8435	156.1902	167.5726	181.9409	195.4451	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	(71)
Water heating gains (Table 5)	115.1943	113.1318	108.8488	103.0261	99.2458	93.9230	89.3987	95.1955	97.2552	103.2818	110.0869	113.1404	(72)
Total internal gains	399.3464	397.2931	384.5296	364.0090	343.2516	323.2216	310.2009	315.9885	326.5286	347.2532	371.0353	388.7960	(73)

6. Solar gains

[Jan]				Area	Solar flux		g	FF		Access		Gains	
				m2	Table 6a		Specific data	Specific data		factor		W	
					W/m2		or Table 6b	or Table 6c		Table 6d			
Southwest				12.1000	36.7938		0.6300	0.7000		0.7700		136.0605 (79)	
Solar gains	136.0605	231.7615	317.1061	392.9099	440.0918	436.9093	421.2272	386.0273	343.3589	256.1458	162.9692	116.4395	(83)
Total gains	535.4069	629.0545	701.6357	756.9188	783.3434	760.1309	731.4280	702.0158	669.8875	603.3990	534.0045	505.2355	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	71.8590	72.0590	72.2561	73.1966	73.3752	74.2186	74.2186	74.3769	73.8915	73.3752	73.0147	72.6415
alpha	5.7906	5.8039	5.8171	5.8798	5.8917	5.9479	5.9479	5.9585	5.9261	5.8917	5.8676	5.8428
util living area	0.9944	0.9852	0.9614	0.8949	0.7595	0.5667	0.4103	0.4453	0.6785	0.9187	0.9860	0.9959 (86)
MIT	20.1393	20.3156	20.5419	20.7840	20.9351	20.9905	20.9988	20.9981	20.9737	20.7794	20.4134	20.1063 (87)
Th 2	20.1114	20.1137	20.1159	20.1263	20.1282	20.1373	20.1373	20.1390	20.1338	20.1282	20.1243	20.1202 (88)
util rest of house	0.9926	0.9808	0.9501	0.8665	0.7061	0.4944	0.3306	0.3631	0.6047	0.8900	0.9810	0.9946 (89)
MIT 2	18.9712	19.2275	19.5504	19.8863	20.0693	20.1313	20.1368	20.1382	20.1151	19.8891	19.3788	18.9299 (90)
Living area fraction									fLA = Living area / (4) =			0.3747 (91)
MIT	19.4089	19.6352	19.9220	20.2227	20.3937	20.4533	20.4598	20.4604	20.4369	20.2227	19.7665	19.3707 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4089	19.6352	19.9220	20.2227	20.3937	20.4533	20.4598	20.4604	20.4369	20.2227	19.7665	19.3707 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9908	0.9778	0.9472	0.8700	0.7231	0.5213	0.3605	0.3939	0.6314	0.8935	0.9784	0.9931	(94)
Useful gains	530.4559	615.0675	664.5624	658.5078	566.4511	396.2217	263.6821	276.5460	422.9609	539.1305	522.4829	501.7375	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1067.6429	1038.3453	943.2242	785.4750	601.6325	400.4599	264.0765	277.2080	435.4649	665.9205	880.8887	1060.4627	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	399.6671	284.4427	207.3244	91.4164	26.1750	0.0000	0.0000	0.0000	0.0000	94.3318	258.0522	415.6915	(98)
Space heating												1777.1011	(98)
Space heating per m2												24.3039	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1900.6428 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	399.6671	284.4427	207.3244	91.4164	26.1750	0.0000	0.0000	0.0000	0.0000	94.3318	258.0522	415.6915	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	427.4515	304.2168	221.7373	97.7716	27.9946	0.0000	0.0000	0.0000	0.0000	100.8896	275.9916	444.5899	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	192.2450	169.4722	178.0463	159.6944	156.5588	139.9823	134.5249	147.4958	147.1978	165.5896	174.9838	187.6492	(64)
Efficiency of water heater (217)m	86.7233	86.1854	85.2207	83.3893	81.1747	79.8000	79.8000	79.8000	79.8000	83.3777	85.8486	79.8000	(216)
Fuel for water heating, kWh/month	221.6763	196.6367	208.9239	191.5048	192.8663	175.4164	168.5775	184.8318	184.4584	198.6018	203.8285	215.9941	(219)
Water heating fuel used												2343.3167	(219)
Annual totals kWh/year													
Space heating fuel - main system												1900.6428	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												333.6730	(232)
Total delivered energy for all uses												4652.6326	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1900.6428	0.2160	410.5389 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2343.3167	0.2160	506.1564 (264)
Space and water heating			916.6953 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	333.6730	0.5190	173.1763 (268)
Total CO2, kg/m2/year			1128.7965 (272)
Emissions per m2 for space and water heating			12.5369 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3684 (272b)
Emissions per m2 for pumps and fans			0.5323 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.5369 * 1.00) + 2.3684 + 0.5323, rounded to 2 d.p.			15.4400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	009				Issued on Date	29/04/2022
Assessment Reference	009			Prop Type Ref		
Property						
SAP Rating	85 B	DER	13.57	TER	15.25	
Environmental	90 B	% DER<TER	11.02			
CO ₂ Emissions (t/year)	0.84	DFEE	30.36	TFEE	34.99	
General Requirements Compliance	Fail	% DFEE<TFEE	13.24			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 72 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Mains gas (c)
Fuel factor: 1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 15.25 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.57 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 35.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 30.4 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading: Average
Windows facing South West: 5.88 m², No overhang
Windows facing West: 3.92 m², No overhang
Windows facing North West: 2.55 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.0300 (1b)	x 2.5000 (2b)	= 180.0750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 180.0750 (5)

2. Ventilation rate

					main	secondary		other		total	m3 per hour		
					heating		heating						
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)	
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)	
Number of intermittent fans											0 * 10 =	0.0000 (7a)	
Number of passive vents											0 * 10 =	0.0000 (7b)	
Number of flueless gas fires											0 * 40 =	0.0000 (7c)	
											Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =										0.0000 / (5) =		0.0000 (8)	
Pressure test												Yes	
Measured/design AP50												3.0000	
Infiltration rate												0.1500 (18)	
Number of sides sheltered												2 (19)	
Shelter factor										(20) = 1 - [0.075 x (19)] =		0.8500 (20)	
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =		0.1275 (21)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)	
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)	
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)	
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation:												0.5000 (23a)	
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)	
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)	

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			12.3500	1.1450	14.1412		(27)					
External Wall	39.7500	12.3500	27.4000	0.1500	4.1100		(29a)					
Corridor	10.1800	1.8900	8.2900	0.2500	2.0725		(29a)					
Total net area of external elements Aum(A, m2)			49.9300				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		22.2137		(33)					
Party Wall			37.2500	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							250.0000 (35)					
Total fabric heat loss							7.1546 (36)					
						(33) + (36) =	29.3683 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 16.6426	Feb 16.4532	Mar 16.2638	Apr 15.3167	May 15.1273	Jun 14.1802	Jul 14.1802	Aug 13.9908	Sep 14.5591	Oct 15.1273	Nov 15.5061	Dec 15.8850 (38)
Heat transfer coeff	46.0110	45.8215	45.6321	44.6851	44.4956	43.5486	43.5486	43.3591	43.9274	44.4956	44.8745	45.2533 (39)
Average = Sum(39)m / 12 =												44.6377 (39)
HLP	Jan 0.6388	Feb 0.6361	Mar 0.6335	Apr 0.6204	May 0.6177	Jun 0.6046	Jul 0.6046	Aug 0.6020	Sep 0.6098	Oct 0.6177	Nov 0.6230	Dec 0.6283 (40)
HLP (average)												0.6197 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2944 (42)
Average daily hot water use (litres/day)												88.6916 (43)
Daily hot water use	Jan 97.5607	Feb 94.0131	Mar 90.4654	Apr 86.9177	May 83.3701	Jun 79.8224	Jul 79.8224	Aug 83.3701	Sep 86.9177	Oct 90.4654	Nov 94.0131	Dec 97.5607 (44)
Energy conte	144.6798	126.5378	130.5757	113.8391	109.2313	94.2583	87.3442	100.2287	101.4258	118.2020	129.0267	140.1146 (45)
Energy content (annual)										Total = Sum(45)m =		1395.4639 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.7020	18.9807	19.5864	17.0759	16.3847	14.1387	13.1016	15.0343	15.2139	17.7303	19.3540	21.0172 (46)
Water storage loss:												

store volume													110.0000	(47)
b) If manufacturer declared loss factor is not known :														
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152	(51)
Volume factor from Table 2a													1.0294	(52)
Temperature factor from Table 2b													0.6000	(53)
Enter (49) or (54) in (55)													1.0327	(55)
Total storage loss														
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage														
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	(59)
Total heat required for water heating calculated for each month														
199.9566	176.4653	185.8525	167.3328	164.5081	147.7520	142.6210	155.5055	154.9194	173.4788	182.5204	195.3914	162		
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =													0.0000	(63)
Output from w/h														
199.9566	176.4653	185.8525	167.3328	164.5081	147.7520	142.6210	155.5055	154.9194	173.4788	182.5204	195.3914	164		
Total per year (kWh/year) = Sum(64)m =													2046.3037	(64)
Heat gains from water heating, kWh/month														
92.3275	82.0158	87.6379	80.6464	80.5408	74.1358	73.2634	77.5475	76.5190	83.5236	85.6963	90.8096	65		

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.1753	16.1432	13.1285	9.9391	7.4296	6.2724	6.7775	8.8097	11.8244	15.0137	17.5233	18.6805 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9878	204.0838	198.8019	187.5575	173.3634	160.0230	151.1107	149.0147	154.2966	165.5410	179.7351	193.0756 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753 (71)
Water heating gains (Table 5)	124.0961	122.0473	117.7928	112.0089	108.2538	102.9664	98.4723	104.2305	106.2764	112.2629	119.0227	122.0559 (72)
Total internal gains	401.6749	399.6900	387.1390	366.9213	346.4626	326.6775	313.7763	319.4707	329.8131	350.2334	373.6968	391.2276 (73)

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Southwest	5.8800	36.7938	0.4000	0.8000	0.7700	47.9773 (79)
West	3.9200	19.6403	0.4000	0.8000	0.7700	17.0733 (80)
Northwest	2.5500	11.2829	0.4000	0.8000	0.7700	6.3804 (81)

7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, n _{l,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	108.7150	109.1644	109.6176	111.9409	112.4174	114.8622	114.8622	115.3640	113.8716	112.4174	111.4684	110.5352
alpha	8.2477	8.2776	8.3078	8.4627	8.4945	8.6575	8.6575	8.6909	8.5914	8.4945	8.4312	8.3690
util living area	0.9929	0.9814	0.9429	0.8200	0.6301	0.4377	0.3143	0.3445	0.5562	0.8610	0.9785	0.9948 (86)
MIT	20.5706	20.6839	20.8312	20.9583	20.9953	20.9998	21.0000	21.0000	20.9987	20.9485	20.7502	20.5518 (87)
Th 2	20.3952	20.3976	20.3999	20.4117	20.4141	20.4259	20.4259	20.4282	20.4211	20.4141	20.4093	20.4046 (88)
util rest of house	0.9909	0.9765	0.9295	0.7906	0.5921	0.3985	0.2733	0.3017	0.5102	0.8295	0.9720	0.9933 (89)
MIT 2	19.8230	19.9873	20.1942	20.3674	20.4100	20.4258	20.4259	20.4282	20.4202	20.3607	20.0932	19.8036 (90)
Living area fraction									f _{LA} = Living area / (4) =			0.3762 (91)
MIT	20.1043	20.2494	20.4338	20.5897	20.6302	20.6417	20.6419	20.6433	20.6379	20.5819	20.3404	20.0851 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1043	20.2494	20.4338	20.5897	20.6302	20.6417	20.6419	20.6433	20.6379	20.5819	20.3404	20.0851 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9897	0.9751	0.9304	0.7998	0.6062	0.4133	0.2887	0.3178	0.5275	0.8390	0.9712	0.9923 (94)
Useful gains	468.2435	514.6505	537.1574	499.1664	395.0128	263.0353	176.0150	183.9817	286.6253	416.1828	447.1976	448.0649 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	727.1693	703.3320	635.8312	522.3548	397.3557	263.1090	176.0177	183.9876	287.1920	444.1506	594.1564	718.8542 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	192.6408	126.7939	73.4133	16.6957	1.7431	0.0000	0.0000	0.0000	0.0000	20.8080	105.8104	201.4672 (98)
Space heating												739.3725 (98)
Space heating per m2												10.2648 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	739.3725 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	776.3411 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2046.3037 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2148.6189 (310a)
Electricity used for heat distribution	29.2496 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	173.0071 (330a)
Total electricity for the above, kWh/year	173.0071 (331)
Electricity for lighting (calculated in Appendix L)	320.9819 (332)
Total delivered energy for all uses	3418.9489 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3268.1117	0.2160	705.9121 (367)
Electrical energy for heat distribution	29.2496	0.5190	15.1805 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			721.0927 (373)
Space and water heating			721.0927 (376)
Pumps and fans	173.0071	0.5190	89.7907 (378)
Energy for lighting	320.9819	0.5190	166.5896 (379)
Total CO2, kg/year			977.4729 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			13.5700 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		13.5700 ZC1
Total Floor Area	TFA	72.0300
Assumed number of occupants	N	2.2944
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.6172 ZC2
CO2 emissions from cooking, equation (L16)		2.4166 ZC3
Total CO2 emissions		32.6038 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		32.6038 ZC8

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.0300 (1b)	x 2.5000 (2b)	= 180.0750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 180.0750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1666 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4166 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3541 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4515	0.4426	0.4338	0.3895	0.3807	0.3364	0.3364	0.3275	0.3541	0.3807	0.3984	0.4161 (22b)
	0.6019	0.5980	0.5941	0.5759	0.5725	0.5566	0.5566	0.5536	0.5627	0.5725	0.5793	0.5866 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			12.3500	1.3258	16.3731		(27)
External Wall	39.7500	12.3500	27.4000	0.1800	4.9320		(29a)
Corridor	10.1800	1.8900	8.2900	0.1800	1.4922		(29a)
Total net area of external elements Aum(A, m ²)			49.9300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.6873		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.2448 (36)
Total fabric heat loss						(33) + (36) =	29.9321 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	35.7690	35.5338	35.3033	34.2205	34.0179	33.0748	33.0748
Heat transfer coeff	65.7011	65.4659	65.2354	64.1526	63.9500	63.0069	63.0069
Average = Sum(39)m / 12 =						62.8323	63.3702
						63.9500	64.3598
						64.7883	64.1516 (39)
						64.1516 (39)	
HLP	0.9121	0.9089	0.9057	0.8906	0.8878	0.8747	0.8747
HLP (average)						0.8723	0.8798
Days in month	31	28	31	30	31	30	31
						30	31
						31	30
						31	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2944 (42)
Average daily hot water use (litres/day)												88.6916 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.5607	94.0131	90.4654	86.9177	83.3701	79.8224	79.8224	83.3701	86.9177	90.4654	94.0131	97.5607 (44)
Energy conte	144.6798	126.5378	130.5757	113.8391	109.2313	94.2583	87.3442	100.2287	101.4258	118.2020	129.0267	140.1146 (45)
Energy content (annual)										Total = Sum(45)m =		1395.4639 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.7020	18.9807	19.5864	17.0759	16.3847	14.1387	13.1016	15.0343	15.2139	17.7303	19.3540	21.0172 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

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If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	191.2747	168.6236	177.1706	158.9309	155.8262	139.3501	133.9391	146.8236	146.5176	164.7969	174.1185	186.7095 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	191.2747	168.6236	177.1706	158.9309	155.8262	139.3501	133.9391	146.8236	146.5176	164.7969	174.1185	186.7095 (64)
	85.3819	75.7424	80.6923	73.9250	73.5953	67.4144	66.3179	70.6020	69.7975	76.5781	78.9748	83.8640 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5438	16.4704	13.3947	10.1406	7.5802	6.3996	6.9149	8.9883	12.0641	15.3181	17.8785	19.0592	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9878	204.0838	198.8019	187.5575	173.3634	160.0230	151.1107	149.0147	154.2966	165.5410	179.7351	193.0756	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	(71)
Water heating gains (Table 5)	114.7607	112.7119	108.4575	102.6736	98.9185	93.6311	89.1369	94.8951	96.9410	102.9275	109.6873	112.7205	(72)
Total internal gains	395.7080	393.6819	381.0698	360.7874	340.2778	320.4693	307.5783	313.3139	323.7174	344.2024	367.7166	385.2710	(73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Southwest			5.8800		36.7938		0.6300		0.7000		0.7700		66.1187 (79)
West			3.9200		19.6403		0.6300		0.7000		0.7700		23.5291 (80)
Northwest			2.5500		11.2829		0.6300		0.7000		0.7700		8.7929 (81)
Solar gains	98.4407	176.5508	262.1463	354.4454	420.5353	426.9027	407.7337	357.6112	294.3091	200.9633	119.5968		83.1138 (83)
Total gains	494.1487	570.2327	643.2161	715.2328	760.8132	747.3720	715.3120	670.9251	618.0265	545.1657	487.3134		468.3847 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.1340	76.4075	76.6775	77.9717	78.2187	79.3894	79.3894	79.6101	78.9343	78.2187	77.7206	77.2066	
alpha	6.0756	6.0938	6.1118	6.1981	6.2146	6.2926	6.2926	6.3073	6.2623	6.2146	6.1814	6.1471	
util living area	0.9957	0.9890	0.9676	0.8937	0.7373	0.5344	0.3870	0.4296	0.6817	0.9312	0.9892	0.9968	(86)
MIT	20.1752	20.3317	20.5585	20.8125	20.9537	20.9947	20.9994	20.9989	20.9781	20.7845	20.4357	20.1508	(87)
Th 2	20.1572	20.1600	20.1627	20.1755	20.1779	20.1890	20.1890	20.1911	20.1847	20.1779	20.1730	20.1680	(88)
util rest of house	0.9943	0.9856	0.9580	0.8659	0.6853	0.4690	0.3160	0.3547	0.6113	0.9062	0.9853	0.9958	(89)
MIT 2	19.0583	19.2872	19.6128	19.9669	20.1362	20.1857	20.1888	20.1907	20.1690	19.9403	19.4494	19.0312	(90)
Living area fraction	19.4785	19.6802	19.9686	20.2851	20.4438	20.4901	20.4938	20.4947	20.4734	20.2579	19.8205	19.4524	(91)
MIT	19.4785	19.6802	19.9686	20.2851	20.4438	20.4901	20.4938	20.4947	20.4734	20.2579	19.8205	19.4524	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4785	19.6802	19.9686	20.2851	20.4438	20.4901	20.4938	20.4947	20.4734	20.2579	19.8205	19.4524	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	490.6249	560.6724	614.4704	622.2038	534.6411	368.8203	245.1432	256.9055	393.6713	495.5482	479.1311	465.8693	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	997.2450	967.5969	878.6310	730.3805	559.1638	371.1163	245.3351	257.2815	403.8865	617.6215	818.6890	988.1775	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	376.9254	273.4533	196.5355	77.8872	18.2449	0.0000	0.0000	0.0000	0.0000	90.8225	244.4817	388.5973	(98)
Space heating												1666.9477	(98)
Space heating per m2												23.1424	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1782.8318 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	376.9254	273.4533	196.5355	77.8872	18.2449	0.0000	0.0000	0.0000	0.0000	90.8225	244.4817	388.5973	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	403.1287	292.4634	210.1984	83.3018	19.5133	0.0000	0.0000	0.0000	0.0000	97.1364	261.4777	415.6120	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	191.2747	168.6236	177.1706	158.9309	155.8262	139.3501	133.9391	146.8236	146.5176	164.7969	174.1185	186.7095	(64)
Efficiency of water heater (217)m	86.5915	86.0966	85.0909	83.0286	80.8013	79.8000	79.8000	79.8000	79.8000	83.2993	85.7192	79.8000	(216)
Fuel for water heating, kWh/month	220.8932	195.8539	208.2134	191.4171	192.8511	174.6242	167.8435	183.9895	183.6060	197.8371	203.1267	215.2866	(219)
Water heating fuel used												2335.5422	(219)
Annual totals kWh/year													
Space heating fuel - main system												1782.8318	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												327.4893	(232)
Total delivered energy for all uses												4520.8633	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1782.8318	0.2160	385.0917 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2335.5422	0.2160	504.4771 (264)
Space and water heating			889.5688 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	327.4893	0.5190	169.9670 (268)
Total CO2, kg/m2/year			1098.4607 (272)
Emissions per m2 for space and water heating			12.3500 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3597 (272b)
Emissions per m2 for pumps and fans			0.5404 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.3500 * 1.00) + 2.3597 + 0.5404, rounded to 2 d.p.			15.2500 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010			Issued on Date	29/04/2022
Assessment Reference	010	Prop Type Ref			
Property					
SAP Rating	85 B	DER	14.71	TER	16.26
Environmental	89 B	% DER<TER	9.52		
CO ₂ Emissions (t/year)	0.86	DFEE	34.34	TFEE	40.29
General Requirements Compliance	Fail	% DFEE<TFEE	14.77		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 70 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 16.26 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.71 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 40.3 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 34.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing North:	1.37 m ² , No overhang
Windows facing North East:	8.98 m ² , No overhang
Windows facing North West:	6.24 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	69.9600 (1b)	x 2.5000 (2b)	= 174.9000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.9000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			16.5900	1.1450	18.9962		(27)
External Wall	37.2300	16.5900	20.6400	0.1500	3.0960		(29a)
Corridor	5.6000	1.8900	3.7100	0.2500	0.9275		(29a)
Total net area of external elements Aum(A, m ²)				42.8300			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.9097		(33)
Party Wall				39.7800	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K	250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	7.1180 (36)
Total fabric heat loss	(33) + (36) = 32.0277 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 16.1644	Feb 15.9804	Mar 15.7964	Apr 14.8766	May 14.6926	Jun 13.7727	Jul 13.7727	Aug 13.5887	Sep 14.1407	Oct 14.6926	Nov 15.0605	Dec 15.4285 (38)
Heat transfer coeff	48.1921	48.0081	47.8241	46.9042	46.7203	45.8004	45.8004	45.6164	46.1683	46.7203	47.0882	47.4562 (39)
Average = Sum(39)m / 12 =												46.8582 (39)

HLP	Jan 0.6889	Feb 0.6862	Mar 0.6836	Apr 0.6704	May 0.6678	Jun 0.6547	Jul 0.6547	Aug 0.6520	Sep 0.6599	Oct 0.6678	Nov 0.6731	Dec 0.6783 (40)
HLP (average)												0.6698 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2452 (42)
Average daily hot water use (litres/day)	87.5224 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.2746	92.7737	89.2728	85.7719	82.2710	78.7702	78.7702	82.2710	85.7719	89.2728	92.7737	96.2746 (44)
Energy conte	142.7725	124.8697	128.8544	112.3384	107.7913	93.0157	86.1928	98.9074	100.0887	116.6437	127.3258	138.2675 (45)
Energy content (annual)												Total = Sum(45)m = 1377.0680 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.4159	18.7305	19.3282	16.8508	16.1687	13.9524	12.9289	14.8361	15.0133	17.4966	19.0989	20.7401 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (56)													
If cylinder contains dedicated solar storage													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (57)													
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month													
198.0493 174.7972 184.1312 165.8321 163.0681 146.5094 141.4696 154.1842 153.5824 171.9205 180.8194 193.5443 (62)													
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
198.0493 174.7972 184.1312 165.8321 163.0681 146.5094 141.4696 154.1842 153.5824 171.9205 180.8194 193.5443 (64)													
Total per year (kWh/year) = Sum(64)m =													2027.9078 (64)
Heat gains from water heating, kWh/month													
91.6933 81.4611 87.0655 80.1475 80.0621 73.7227 72.8805 77.1082 76.0744 83.0055 85.1308 90.1954 (65)													

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)													
(66)m 112.2577 112.2577 112.2577 112.2577 112.2577 112.2577 112.2577 112.2577 112.2577 112.2577 112.2577 112.2577 112.2577 (66)													
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
17.5809 15.6152 12.6991 9.6140 7.1866 6.0672 6.5559 8.5216 11.4376 14.5227 16.9501 18.0695 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
197.2037 199.2500 194.0933 183.1152 169.2573 156.2328 147.5316 145.4853 150.6420 161.6202 175.4781 188.5025 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.2258 34.2258 34.2258 34.2258 34.2258 34.2258 34.2258 34.2258 34.2258 34.2258 34.2258 34.2258 34.2258 (69)													
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													
-89.8061 -89.8061 -89.8061 -89.8061 -89.8061 -89.8061 -89.8061 -89.8061 -89.8061 -89.8061 -89.8061 -89.8061 -89.8061 (71)													
Water heating gains (Table 5)													
123.2437 121.2219 117.0236 111.3159 107.6103 102.3926 97.9577 103.6400 105.6589 111.5665 118.2372 121.2304 (72)													
Total internal gains													
394.7055 392.7644 380.4932 360.7224 340.7315 321.3699 308.7225 314.3242 324.4159 344.3867 367.3426 384.4797 (73)													

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North					1.3700	10.6334		0.4000	0.8000	0.7700	3.2305 (74)	
Northeast					8.9800	11.2829		0.4000	0.8000	0.7700	22.4689 (75)	
Northwest					6.2400	11.2829		0.4000	0.8000	0.7700	15.6131 (81)	
Solar gains	41.3126	83.6908	150.1518	246.2144	331.0093	352.9914	330.1712	263.1292	182.7925	102.0811	51.9024	33.7928 (83)
Total gains	436.0181	476.4553	530.6451	606.9369	671.7408	674.3613	638.8937	577.4534	507.2084	446.4677	419.2450	418.2725 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	100.8119	101.1982	101.5875	103.5798	103.9877	106.0762	106.0762	106.5040	105.2308	103.9877	103.1751	102.3752
alpha	7.7208	7.7465	7.7725	7.9053	7.9325	8.0717	8.0717	8.1003	8.0154	7.9325	7.8783	7.8250
util living area	0.9959	0.9908	0.9676	0.8557	0.6395	0.4344	0.3154	0.3633	0.6224	0.9218	0.9890	0.9969 (86)
MIT	20.4569	20.5589	20.7359	20.9291	20.9927	20.9997	21.0000	20.9999	20.9957	20.8906	20.6473	20.4415 (87)
Th 2	20.3507	20.3530	20.3553	20.3670	20.3694	20.3811	20.3811	20.3834	20.3764	20.3694	20.3647	20.3600 (88)
util rest of house	0.9947	0.9882	0.9587	0.8273	0.5986	0.3925	0.2710	0.3147	0.5685	0.8976	0.9854	0.9960 (89)
MIT 2	19.6213	19.7709	20.0247	20.2900	20.3630	20.3809	20.3810	20.3834	20.3733	20.2493	19.9093	19.6066 (90)
Living area fraction									fLA = Living area / (4) =			0.3616 (91)
MIT	19.9235	20.0559	20.2819	20.5212	20.5907	20.6047	20.6049	20.6063	20.5984	20.4812	20.1762	19.9085 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9235	20.0559	20.2819	20.5212	20.5907	20.6047	20.6049	20.6063	20.5984	20.4812	20.1762	19.9085 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.9937 0.9867 0.9575 0.8346 0.6131 0.4076 0.2871 0.3323 0.5879 0.9023 0.9840 0.9952 (94)												
Useful gains	433.2913	470.1090	508.0998	506.5296	411.8289	274.8990	183.4193	191.8614	298.1829	402.8558	412.5481	416.2650 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	752.9298	727.6041	659.1054	545.0816	415.3778	275.0159	183.4248	191.8785	300.0211	461.6542	615.7340	745.4660 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	237.8110	173.0367	112.3481	27.7574	2.6403	0.0000	0.0000	0.0000	0.0000	43.7461	146.2939	244.9255 (98)
Space heating												988.5590 (98)
Space heating per m2										(98) / (4) =		14.1303 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	988.5590 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1037.9870 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2027.9078 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2129.3032 (310a)
Electricity used for heat distribution	31.6729 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	168.0352 (330a)
Total electricity for the above, kWh/year	168.0352 (331)
Electricity for lighting (calculated in Appendix L)	310.4834 (332)
Total delivered energy for all uses	3645.8087 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3538.8717	0.2160	764.3963 (367)
Electrical energy for heat distribution	31.6729	0.5190	16.4382 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			780.8345 (373)
Space and water heating			780.8345 (376)
Pumps and fans	168.0352	0.5190	87.2103 (378)
Energy for lighting	310.4834	0.5190	161.1409 (379)
Total CO2, kg/year			1029.1856 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.7100 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		14.7100 ZC1
Total Floor Area	TFA	69.9600
Assumed number of occupants	N	2.2452
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.7037 ZC2
CO2 emissions from cooking, equation (L16)		2.4712 ZC3
Total CO2 emissions		33.8848 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		33.8848 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	69.9600 (1b)	x 2.5000 (2b)	= 174.9000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.9000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1144 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3644 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3097 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.3949	0.3871	0.3794	0.3407	0.3329	0.2942	0.2942	0.2865	0.3097	0.3329	0.3484	0.3639 (22b)
	0.5780	0.5749	0.5720	0.5580	0.5554	0.5433	0.5433	0.5410	0.5480	0.5554	0.5607	0.5662 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			15.6200	1.3258	20.7083		(27)					
External Wall	37.2300	15.6200	21.6100	0.1800	3.8898		(29a)					
Corridor	5.6000	1.8900	3.7100	0.1800	0.6678		(29a)					
Total net area of external elements Aum(A, m2)			42.8300				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	27.1559	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.3022 (36)					
Total fabric heat loss						(33) + (36) =	32.4581 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 33.3581	Feb 33.1834	Mar 33.0121	Apr 32.2077	May 32.0572	Jun 31.3565	Jul 31.3565	Aug 31.2268	Sep 31.6264	Oct 32.0572	Nov 32.3616	Dec 32.6799 (38)
Heat transfer coeff	65.8162	65.6415	65.4702	64.6658	64.5153	63.8147	63.8147	63.6849	64.0845	64.5153	64.8198	65.1381 (39)
Average = Sum(39)m / 12 =												64.6651 (39)
HLP	Jan 0.9408	Feb 0.9383	Mar 0.9358	Apr 0.9243	May 0.9222	Jun 0.9122	Jul 0.9122	Aug 0.9103	Sep 0.9160	Oct 0.9222	Nov 0.9265	Dec 0.9311 (40)
HLP (average)												0.9243 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2452 (42)
Average daily hot water use (litres/day)												87.5224 (43)
Daily hot water use	96.2746	92.7737	89.2728	85.7719	82.2710	78.7702	78.7702	82.2710	85.7719	89.2728	92.7737	96.2746 (44)
Energy conte	142.7725	124.8697	128.8544	112.3384	107.7913	93.0157	86.1928	98.9074	100.0887	116.6437	127.3258	138.2675 (45)
Energy content (annual)										Total = Sum(45)m =		1377.0680 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4159	18.7305	19.3282	16.8508	16.1687	13.9524	12.9289	14.8361	15.0133	17.4966	19.0989	20.7401 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	189.3674	166.9555	175.4493	157.4302	154.3862	138.1076	132.7877	145.5023	145.1806	163.2386	172.4176	184.8624 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	189.3674	166.9555	175.4493	157.4302	154.3862	138.1076	132.7877	145.5023	145.1806	163.2386	172.4176	184.8624 (64)
	84.7478	75.1878	80.1200	73.4260	73.1165	67.0012	65.9350	70.1626	69.3530	76.0600	78.4093	83.2499 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.5804	15.6147	12.6988	9.6138	7.1864	6.0671	6.5557	8.5213	11.4373	14.5223	16.9497	18.0690	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.2037	199.2500	194.0933	183.1152	169.2573	156.2328	147.5316	145.4853	150.6420	161.6202	175.4781	188.5025	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	(71)
Water heating gains (Table 5)	113.9083	111.8866	107.6882	101.9805	98.2749	93.0572	88.6223	94.3046	96.3236	102.2311	108.9018	111.8950	(72)
Total internal gains	388.3697	386.4286	374.1575	354.3868	334.3959	315.0344	302.3870	307.9885	318.0802	338.0509	361.0068	378.1438	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W		
North				1.2900	10.6334	0.6300	0.7000	0.7700		4.1921 (74)		
Northeast				8.4600	11.2829	0.6300	0.7000	0.7700		29.1719 (75)		
Northwest				5.8700	11.2829	0.6300	0.7000	0.7700		20.2410 (81)		
Solar gains	53.6050	108.5927	194.8289	319.4745	429.4998	458.0225	428.4123	341.4222	237.1817	132.4549	67.3457	43.8478 (83)
Total gains	441.9747	495.0214	568.9864	673.8613	763.8957	773.0569	730.7993	649.4108	555.2619	470.5058	428.3525	421.9916 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.8167	74.0131	74.2068	75.1299	75.3051	76.1319	76.1319	76.2870	75.8113	75.3051	74.9514	74.5852	
alpha	5.9211	5.9342	5.9471	6.0087	6.0203	6.0755	6.0755	6.0858	6.0541	6.0203	5.9968	5.9723	
util living area	0.9973	0.9941	0.9804	0.9129	0.7372	0.5231	0.3835	0.4491	0.7452	0.9615	0.9939	0.9979	(86)
MIT	20.0812	20.2115	20.4531	20.7658	20.9484	20.9943	20.9993	20.9982	20.9602	20.6939	20.3349	20.0587	(87)
Th 2	20.1330	20.1351	20.1372	20.1469	20.1487	20.1572	20.1572	20.1587	20.1539	20.1487	20.1450	20.1412	(88)
util rest of house	0.9964	0.9922	0.9740	0.8879	0.6840	0.4565	0.3104	0.3681	0.6726	0.9451	0.9916	0.9973	(89)
MIT 2	18.9031	19.0943	19.4443	19.8824	20.1024	20.1537	20.1569	20.1580	20.1241	19.7972	19.2825	18.8765	(90)
Living area fraction	19.3291	19.4983	19.8091	20.2018	20.4083	20.4577	20.4615	20.4619	20.4265	20.1215	19.6631	19.3041	(91)
MIT	19.3291	19.4983	19.8091	20.2018	20.4083	20.4577	20.4615	20.4619	20.4265	20.1215	19.6631	19.3041	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3291	19.4983	19.8091	20.2018	20.4083	20.4577	20.4615	20.4619	20.4265	20.1215	19.6631	19.3041	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	439.8936	490.2224	552.4755	599.5080	535.3886	371.4575	246.2016	258.1048	387.1426	444.3687	423.9941	420.4513	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	989.1610	958.2563	871.3503	730.8429	561.8207	373.8073	246.4229	258.6801	405.4303	614.2799	814.3358	983.8497	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	408.6550	314.5188	237.2428	94.5611	19.6654	0.0000	0.0000	0.0000	0.0000	126.4140	281.0460	419.1684	(98)
Space heating												1901.2715	(98)
Space heating per m2												27.1766	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2033.4455 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	408.6550	314.5188	237.2428	94.5611	19.6654	0.0000	0.0000	0.0000	0.0000	126.4140	281.0460	419.1684	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	437.0642	336.3837	253.7357	101.1349	21.0326	0.0000	0.0000	0.0000	0.0000	135.2021	300.5840	448.3084	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	189.3674	166.9555	175.4493	157.4302	154.3862	138.1076	132.7877	145.5023	145.1806	163.2386	172.4176	184.8624	(64)
Efficiency of water heater (217)m	86.8140	86.4791	85.6193	83.5049	80.8804	79.8000	79.8000	79.8000	79.8000	84.1417	86.1099	79.8000	(216)
Fuel for water heating, kWh/month	218.1301	193.0587	204.9178	188.5282	190.8820	173.0671	166.4006	182.3338	181.9305	194.0044	200.2297	212.6503	(219)
Water heating fuel used												2306.1331	(219)
Annual totals kWh/year													
Space heating fuel - main system												2033.4455	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												310.4750	(232)
Total delivered energy for all uses												4725.0536	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2033.4455	0.2160	439.2242 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2306.1331	0.2160	498.1248 (264)
Space and water heating			937.3490 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	310.4750	0.5190	161.1365 (268)
Total CO2, kg/m2/year			1137.4105 (272)
Emissions per m2 for space and water heating			13.3984 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3033 (272b)
Emissions per m2 for pumps and fans			0.5564 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.3984 * 1.00) + 2.3033 + 0.5564, rounded to 2 d.p.			16.2600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	011				Issued on Date	29/04/2022
Assessment Reference	011		Prop Type Ref			
Property						
SAP Rating	85 B	DER	14.21	TER	15.85	
Environmental	90 B	% DER<TER	10.36			
CO ₂ Emissions (t/year)	0.89	DFEE	34.29	TFEE	38.77	
General Requirements Compliance	Pass	% DFEE<TFEE	11.56			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 75 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 15.85 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.21 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)38.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)34.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading: Average
Windows facing North East: 9.93 m², No overhang
Windows facing East: 2.21 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	74.6300 (1b)	x 2.5000 (2b)	= 186.5750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 186.5750 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							3	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.7750 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1163 (21)				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			12.1400	1.1450	13.9008		(27)					
External Wall	31.9300	12.1400	19.7900	0.1500	2.9685		(29a)					
Corridor	25.0000	1.8900	23.1100	0.2500	5.7775		(29a)					
Total net area of external elements Aum(A, m2)				56.9300			(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	24.5368		(33)					
Party Wall			41.5000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.4240 (36)					
Total fabric heat loss							(33) + (36) = 31.9608 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 16.3602	Feb 16.1813	Mar 16.0024	Apr 15.1077	May 14.9287	Jun 14.0341	Jul 14.0341	Aug 13.8551	Sep 14.3919	Oct 14.9287	Nov 15.2866	Dec 15.6445 (38)
Heat transfer coeff	48.3210	48.1421	47.9631	47.0684	46.8895	45.9948	45.9948	45.8159	46.3527	46.8895	47.2474	47.6053 (39)
Average = Sum(39)m / 12 =	47.0237 (39)											
HLP	Jan 0.6475	Feb 0.6451	Mar 0.6427	Apr 0.6307	May 0.6283	Jun 0.6163	Jul 0.6163	Aug 0.6139	Sep 0.6211	Oct 0.6283	Nov 0.6331	Dec 0.6379 (40)
HLP (average)	0.6301 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3531 (42)
Average daily hot water use (litres/day)												90.0860 (43)
Daily hot water use	Jan 99.0946	Feb 95.4911	Mar 91.8877	Apr 88.2843	May 84.6808	Jun 81.0774	Jul 81.0774	Aug 84.6808	Sep 88.2843	Oct 91.8877	Nov 95.4911	Dec 99.0946 (44)
Energy conte	146.9544	128.5272	132.6286	115.6288	110.9486	95.7402	88.7174	101.8045	103.0204	120.0603	131.0552	142.3175 (45)
Energy content (annual)												Total = Sum(45)m = 1417.4032 (45)
Distribution loss (46)m = 0.15 x (45)m												
	22.0432	19.2791	19.8943	17.3443	16.6423	14.3610	13.3076	15.2707	15.4531	18.0090	19.6583	21.3476 (46)
Water storage loss:												

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Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (56)													
If cylinder contains dedicated solar storage													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (57)													
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month													
202.2312 178.4547 187.9054 169.1225 166.2254 149.2339 143.9942 157.0813 156.5141 175.3371 184.5489 197.5943 (62)													
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)	0.0000 (63)
Output from w/h													
202.2312 178.4547 187.9054 169.1225 166.2254 149.2339 143.9942 157.0813 156.5141 175.3371 184.5489 197.5943 (64)													
Heat gains from water heating, kWh/month													
93.0838 82.6773 88.3205 81.2415 81.1119 74.6286 73.7200 78.0714 77.0492 84.1415 86.3708 91.5420 (65)													

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
18.8330 16.7273 13.6036 10.2988 7.6985 6.4994 7.0228 9.1285 12.2522 15.5570 18.1574 19.3564 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
207.8536 210.0105 204.5753 193.0043 178.3980 164.6701 155.4991 153.3422 158.7774 170.3484 184.9547 198.6826 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.7655 34.7655 34.7655 34.7655 34.7655 34.7655 34.7655 34.7655 34.7655 34.7655 34.7655 34.7655 (69)													
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													
-94.1238 -94.1238 -94.1238 -94.1238 -94.1238 -94.1238 -94.1238 -94.1238 -94.1238 -94.1238 -94.1238 -94.1238 (71)													
Water heating gains (Table 5)													
125.1126 123.0316 118.7103 112.8355 109.0213 103.6508 99.0860 104.9347 107.0128 113.0934 119.9594 123.0403 (72)													
Total internal gains													
410.0957 408.0659 395.1855 374.4349 353.4141 333.1167 319.9042 325.7018 336.3389 357.2953 381.3679 399.3758 (73)													

6. Solar gains

[Jan]													
Area													
Solar flux													
Specific data													
Specific data													
Access factor													
Gains													
W													
Northeast	9.9300	11.2829	0.4000	0.8000	0.7700	24.8459 (75)							
East	2.2100	19.6403	0.4000	0.8000	0.7700	9.6255 (76)							
Solar gains	34.4714	69.4041	122.1288	194.8695	256.5765	271.1861	254.6287	206.3297	147.0956	84.1489	43.2644	28.2059 (83)	
Total gains	444.5670	477.4699	517.3143	569.3044	609.9906	604.3027	574.5329	532.0316	483.4345	441.4442	424.6324	427.5817 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
tau	107.2544	107.6530	108.0547	110.1086	110.5288	112.6788	112.6788	113.1188	111.8088	110.5288	109.6916	108.8670	
alpha	8.1503	8.1769	8.2036	8.3406	8.3686	8.5119	8.5119	8.5413	8.4539	8.3686	8.3128	8.2578	
util living area	0.9965	0.9926	0.9758	0.8931	0.7020	0.4866	0.3522	0.3960	0.6546	0.9321	0.9904	0.9973 (86)	
MIT	20.4959	20.5826	20.7356	20.9151	20.9891	20.9995	21.0000	20.9999	20.9953	20.8941	20.6719	20.4819 (87)	
Th 2	20.3875	20.3896	20.3917	20.4025	20.4046	20.4153	20.4153	20.4175	20.4110	20.4046	20.4003	20.3960 (88)	
util rest of house	0.9955	0.9904	0.9689	0.8692	0.6613	0.4424	0.3054	0.3459	0.6017	0.9105	0.9872	0.9966 (89)	
MIT 2	19.7082	19.8359	20.0566	20.3076	20.3948	20.4151	20.4153	20.4175	20.4076	20.2869	19.9746	19.6949 (90)	
Living area fraction									fLA =	Living area / (4) =		0.3631 (91)	
MIT	19.9942	20.1071	20.3031	20.5282	20.6106	20.6273	20.6276	20.6290	20.6210	20.5073	20.2278	19.9807 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.9942	20.1071	20.3031	20.5282	20.6106	20.6273	20.6276	20.6290	20.6210	20.5073	20.2278	19.9807 (93)	

8. Space heating requirement

Utilisation	0.9946	0.9892	0.9678	0.8745	0.6756	0.4584	0.3224	0.3641	0.6208	0.9146	0.9861	0.9959 (94)	
Useful gains	442.1813	472.3277	500.6458	497.8760	412.1033	277.0266	185.2421	193.7323	300.1045	403.7382	418.7185	425.8177 (95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W	758.3598	732.0988	662.0422	547.3224	417.8154	277.2243	185.2503	193.7544	302.2680	464.5506	620.2554	751.2434 (97)	
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)	
Space heating kWh	235.2368	174.5661	120.0789	35.6015	4.2498	0.0000	0.0000	0.0000	0.0000	45.2444	145.1066	242.1167 (98)	
Space heating												1002.2009 (98)	
Space heating per m2												(98) / (4) =	13.4289 (99)

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8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	1002.2009	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1052.3110	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	2068.2430	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2171.6551	(310a)
Electricity used for heat distribution	32.2397	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	179.2519	(330a)
Total electricity for the above, kWh/year	179.2519	(331)
Electricity for lighting (calculated in Appendix L)	332.5970	(332)
Total delivered energy for all uses	3735.8150	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3602.1968	0.2160	778.0745 (367)
Electrical energy for heat distribution	32.2397	0.5190	16.7324 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			794.8069 (373)
Space and water heating			794.8069 (376)
Pumps and fans	179.2519	0.5190	93.0318 (378)
Energy for lighting	332.5970	0.5190	172.6178 (379)
Total CO2, kg/year			1060.4565 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.2100 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER	14.2100	ZC1
Total Floor Area	74.6300	TFA
Assumed number of occupants	2.3531	N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	EF
CO2 emissions from appliances, equation (L14)	16.5040	ZC2
CO2 emissions from cooking, equation (L16)	2.3513	ZC3
Total CO2 emissions	33.0653	ZC4
Residual CO2 emissions offset from biofuel CHP	0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year	0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000	ZC7
Net CO2 emissions	33.0653	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	74.6300 (1b)	x 2.5000 (2b)	= 186.5750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 186.5750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 30.0000 / (5) = 0.1608 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4108 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3184 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4059	0.3980	0.3900	0.3502	0.3422	0.3024	0.3024	0.2945	0.3184	0.3422	0.3582	0.3741 (22b)
	0.5824	0.5792	0.5760	0.5613	0.5586	0.5457	0.5457	0.5434	0.5507	0.5586	0.5641	0.5700 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			12.1400	1.3258	16.0947		(27)					
External Wall	31.9300	12.1400	19.7900	0.1800	3.5622		(29a)					
Corridor	25.0000	1.8900	23.1100	0.1800	4.1598		(29a)					
Total net area of external elements Aum(A, m2)			56.9300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	25.7067		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.4558 (36)					
Total fabric heat loss						(33) + (36) =	31.1625 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 35.8572	Feb 35.6602	Mar 35.4672	Apr 34.5604	May 34.3907	Jun 33.6009	Jul 33.6009	Aug 33.4546	Sep 33.9051	Oct 34.3907	Nov 34.7339	Dec 35.0928 (38)
Heat transfer coeff	67.0197	66.8227	66.6297	65.7229	65.5532	64.7634	64.7634	64.6171	65.0676	65.5532	65.8964	66.2552 (39)
Average = Sum(39)m / 12 =												65.7220 (39)
HLP	Jan 0.8980	Feb 0.8954	Mar 0.8928	Apr 0.8806	May 0.8784	Jun 0.8678	Jul 0.8678	Aug 0.8658	Sep 0.8719	Oct 0.8784	Nov 0.8830	Dec 0.8878 (40)
HLP (average)												0.8806 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3531 (42)
Average daily hot water use (litres/day)												90.0860 (43)
Daily hot water use	99.0946	95.4911	91.8877	88.2843	84.6808	81.0774	81.0774	84.6808	88.2843	91.8877	95.4911	99.0946 (44)
Energy conte	146.9544	128.5272	132.6286	115.6288	110.9486	95.7402	88.7174	101.8045	103.0204	120.0603	131.0552	142.3175 (45)
Energy content (annual)										Total = Sum(45)m =		1417.4032 (45)
Distribution loss (46)m = 0.15 x (45)m	22.0432	19.2791	19.8943	17.3443	16.6423	14.3610	13.3076	15.2707	15.4531	18.0090	19.6583	21.3476 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

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If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	193.5493	170.6130	179.2235	160.7207	157.5435	140.8321	135.3123	148.3994	148.1122	166.6552	176.1471	188.9124 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	193.5493	170.6130	179.2235	160.7207	157.5435	140.8321	135.3123	148.3994	148.1122	166.6552	176.1471	188.9124 (64)
	86.1383	76.4039	81.3749	74.5201	74.1663	67.9071	66.7745	71.1259	70.3277	77.1960	79.6493	84.5965 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.2699	17.1154	13.9192	10.5377	7.8770	6.6501	7.1857	9.3403	12.5365	15.9179	18.5786	19.8055	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	207.8536	210.0105	204.5753	193.0043	178.3980	164.6701	155.4991	153.3422	158.7774	170.3484	184.9547	198.6826	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	(71)
Water heating gains (Table 5)	115.7772	113.6963	109.3749	103.5001	99.6859	94.3154	89.7506	95.5994	97.6774	103.7580	110.6241	113.7050	(72)
Total internal gains	404.1972	402.1185	389.1657	368.3384	347.2574	326.9321	313.7318	319.5782	330.2877	351.3208	375.4538	393.4894	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	9.9300	11.2829	0.6300	0.7000	0.7700	34.2408 (75)
East	2.2100	19.6403	0.6300	0.7000	0.7700	13.2651 (76)
Solar gains	47.5059	95.6475	168.3087	268.5545	353.5944	373.7283
Total gains	451.7031	497.7660	557.4744	636.8930	700.8518	700.6604

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	77.3301	77.5580	77.7827	78.8560	79.0601	80.0242	80.0242	80.2053	79.6501	79.0601	78.6483	78.2223	
alpha	6.1553	6.1705	6.1855	6.2571	6.2707	6.3349	6.3349	6.3470	6.3100	6.2707	6.2432	6.2148	
util living area	0.9978	0.9954	0.9856	0.9380	0.7957	0.5827	0.4276	0.4894	0.7794	0.9685	0.9949	0.9983	(86)
MIT	20.1182	20.2341	20.4499	20.7382	20.9312	20.9918	20.9990	20.9978	20.9555	20.6966	20.3610	20.0994	(87)
Th 2	20.1692	20.1714	20.1736	20.1840	20.1859	20.1950	20.1950	20.1966	20.1915	20.1859	20.1820	20.1779	(88)
util rest of house	0.9970	0.9939	0.9808	0.9185	0.7465	0.5133	0.3500	0.4054	0.7104	0.9547	0.9930	0.9977	(89)
MIT 2	18.9846	19.1552	19.4692	19.8804	20.1217	20.1897	20.1946	20.1957	20.1571	19.8325	19.3489	18.9638	(90)
Living area fraction	19.3963	19.5470	19.8253	20.1919	20.4156	20.4809	20.4867	20.4870	20.4470	20.1463	19.7164	19.3762	(91)
Temperature adjustment	19.3963	19.5470	19.8253	20.1919	20.4156	20.4809	20.4867	20.4870	20.4470	20.1463	19.7164	19.3762	(92)
adjusted MIT	19.3963	19.5470	19.8253	20.1919	20.4156	20.4809	20.4867	20.4870	20.4470	20.1463	19.7164	19.3762	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9961	0.9924	0.9783	0.9188	0.7611	0.5383	0.3782	0.4360	0.7336	0.9539	0.9916	0.9970	(94)
Ext temp.	449.9506	493.9646	545.3883	585.1472	533.4380	377.1712	251.3810	263.3056	390.9856	445.7547	431.4046	431.0583	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1011.7474	978.7525	887.8617	742.1366	571.3385	380.8702	251.7146	264.0871	412.9861	625.7897	831.3767	1005.5016	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	417.9768	325.7774	254.8002	113.0324	28.1980	0.0000	0.0000	0.0000	0.0000	133.9461	287.9798	427.3858	(98)
												1989.0966	(98)
												26.6528	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2127.3760 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	417.9768	325.7774	254.8002	113.0324	28.1980	0.0000	0.0000	0.0000	0.0000	133.9461	287.9798	427.3858	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	447.0340	348.4251	272.5136	120.8902	30.1583	0.0000	0.0000	0.0000	0.0000	143.2578	307.9998	457.0972	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	193.5493	170.6130	179.2235	160.7207	157.5435	140.8321	135.3123	148.3994	148.1122	166.6552	176.1471	188.9124	(64)
Efficiency of water heater (217)m	86.8157	86.5130	85.7520	83.8956	81.2585	79.8000	79.8000	79.8000	79.8000	84.2379	86.1176	86.9272	(216)
Fuel for water heating, kWh/month	222.9427	197.2109	209.0020	191.5722	193.8794	176.4813	169.5643	185.9642	185.6043	197.8386	204.5424	217.3225	(219)
Water heating fuel used												2351.9248	(219)
Annual totals kWh/year													
Space heating fuel - main system												2127.3760	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												340.3127	(232)
Total delivered energy for all uses												4894.6136	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2127.3760	0.2160	459.5132 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2351.9248	0.2160	508.0158 (264)
Space and water heating			967.5290 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	340.3127	0.5190	176.6223 (268)
Total CO2, kg/m2/year			1183.0763 (272)
Emissions per m2 for space and water heating			12.9643 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3666 (272b)
Emissions per m2 for pumps and fans			0.5216 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.9643 * 1.00) + 2.3666 + 0.5216, rounded to 2 d.p.			15.8500 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	012			Issued on Date	29/04/2022
Assessment Reference	012	Prop Type Ref			
Property					
SAP Rating	84 B	DER	15.90	TER	17.71
Environmental	90 B	% DER<TER	10.23		
CO ₂ Emissions (t/year)	0.70	DFEE	33.49	TFEE	37.87
General Requirements Compliance	Fail	% DFEE<TFEE	11.56		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.71 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.90 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 37.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 33.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing North East: 6.24 m², No overhang
Windows facing East: 2.21 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					0.0000 / (5) = 0.0000 (8)
Measured/design AP50					Yes
Infiltration rate					3.0000
Number of sides sheltered					0.1500 (18)
					3 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)
External Wall	19.8500	8.4500	11.4000	0.1500	1.7100		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Total net area of external elements Aum(A, m ²)			37.3500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	17.1781		(33)
Party Wall			37.0000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.3010 (36)
Total fabric heat loss						(33) + (36) =	22.4791 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	11.1341	11.0123	10.8905	10.2816	10.1599	9.5510	9.5510	9.4292	9.7945	10.1599	10.4034	10.6470 (38)
Heat transfer coeff	33.6132	33.4914	33.3696	32.7607	32.6389	32.0301	32.0301	31.9083	32.2736	32.6389	32.8825	33.1260 (39)
Average = Sum(39)m / 12 =												32.7303 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.6618	0.6594	0.6570	0.6450	0.6426	0.6306	0.6306	0.6282	0.6354	0.6426	0.6474	0.6522 (40)
HLP (average)												0.6444 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												

store volume													110.0000	(47)	
b) If manufacturer declared loss factor is not known :															
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152	(51)	
Volume factor from Table 2a													1.0294	(52)	
Temperature factor from Table 2b													0.6000	(53)	
Enter (49) or (54) in (55)													1.0327	(55)	
Total storage loss															
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	30.9817	32.0144	(56)	
If cylinder contains dedicated solar storage															
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	30.9817	32.0144	(57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month															
177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	62)			
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)	
Solar input (sum of months) = Sum(63)m =													0.0000	(63)	
Output from w/h															
177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	64)			
Total per year (kWh/year) = Sum(64)m =													1829.1942	(64)	
Heat gains from water heating, kWh/month															
84.8430	75.4698	80.8830	74.7574	74.8902	69.2597	68.7450	72.3625	71.2721	77.4089	79.0216	83.5613	65)			

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.4839	11.9763	9.7398	7.3736	5.5119	4.6534	5.0281	6.5357	8.7723	11.1384	13.0002	13.8587 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	114.0363	112.3063	108.7138	103.8297	100.6589	96.1941	92.3992	97.2615	98.9891	104.0442	109.7522	112.3135 (72)
Total internal gains	325.5065	323.8179	314.0852	298.5244	283.0012	267.8182	257.8112	262.6320	270.4999	286.2317	304.2921	317.5716 (73)

[Jan]				Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				
Northeast				6.2400	11.2829	0.4000	0.8000	0.7700	15.6131 (75)				
East				2.2100	19.6403	0.4000	0.8000	0.7700	9.6255 (76)				
Solar gains	25.2386	50.6105	88.2687	139.2616	181.8285	191.4969	180.0811	146.8995	105.8366	61.1817	31.6472	20.6660	(83)
Total gains	350.7451	374.4284	402.3539	437.7860	464.8297	459.3151	437.8922	409.5315	376.3365	347.4133	335.9393	338.2376	(84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil/m, see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	104.9316	105.3132	105.6975	107.6620	108.0637	110.1179	110.1179	110.5382	109.2869	108.0637	107.2633	106.4746
alpha	7.9954	8.0209	8.0465	8.1775	8.2042	8.3412	8.3412	8.3692	8.2858	8.2042	8.1509	8.0983
util living area												
	0.9911	0.9830	0.9530	0.8419	0.6460	0.4460	0.3218	0.3584	0.5886	0.8807	0.9771	0.9930 (86)
MIT	20.5663	20.6525	20.7960	20.9433	20.9934	20.9997	21.0000	21.0000	20.9976	20.9318	20.7378	20.5513 (87)
Th 2	20.3747	20.3768	20.3790	20.3896	20.3918	20.4025	20.4025	20.4047	20.3982	20.3918	20.3875	20.3832 (88)
util rest of house												
	0.9887	0.9784	0.9412	0.8131	0.6061	0.4045	0.2781	0.3120	0.5386	0.8506	0.9702	0.9910 (89)
MIT 2	19.7994	19.9248	20.1278	20.3286	20.3860	20.4023	20.4025	20.4046	20.3965	20.3200	20.0566	19.7849 (90)
Living area fraction									fLA = Living area / (4) =			0.5021 (91)
MIT	20.1844	20.2901	20.4632	20.6373	20.6909	20.7023	20.7025	20.7035	20.6983	20.6272	20.3986	20.1697 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1844	20.2901	20.4632	20.6373	20.6909	20.7023	20.7025	20.7035	20.6983	20.6272	20.3986	20.1697 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9878	0.9777	0.9430	0.8252	0.6259	0.4253	0.3001	0.3353	0.5636	0.8629	0.9703	0.9902 (94)
Useful gains	346.4661	366.0705	379.4090	361.2519	290.9326	195.3655	131.3985	137.3085	212.1206	299.7868	325.9688	334.9208 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	533.9248	515.4364	465.9477	384.5210	293.4544	195.4558	131.4026	137.3182	212.9506	327.2758	437.2908	529.0127 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	139.4693	100.3739	64.3848	16.7538	1.8762	0.0000	0.0000	0.0000	0.0000	20.4518	80.1519	144.4044 (98)
Space heating												567.8660 (98)
Space heating per m2												11.1807 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	567.8660	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	596.2593	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1829.1942	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1920.6539	(310a)
Electricity used for heat distribution	25.1691	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	121.9912	(330a)
Total electricity for the above, kWh/year	121.9912	(331)
Electricity for lighting (calculated in Appendix L)	238.1302	(332)
Total delivered energy for all uses	2877.0347	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	2812.1935	0.2160	607.4338 (367)
Electrical energy for heat distribution	25.1691	0.5190	13.0628 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			620.4966 (373)
Space and water heating			620.4966 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	238.1302	0.5190	123.5896 (379)
Total CO2, kg/year			807.3996 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.9000 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER	15.9000	ZC1
Total Floor Area	50.7900	TFA
Assumed number of occupants	1.7134	N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	EF
CO2 emissions from appliances, equation (L14)	17.4175	ZC2
CO2 emissions from cooking, equation (L16)	3.1526	ZC3
Total CO2 emissions	36.4701	ZC4
Residual CO2 emissions offset from biofuel CHP	0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year	0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000	ZC7
Net CO2 emissions	36.4701	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					20.0000 / (5) = 0.1575 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4075 (18)
					3 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)					
External Wall	19.8500	8.4500	11.4000	0.1800	2.0520		(29a)					
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)					
Total net area of external elements Aum(A, m2)			37.3500				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	17.9545		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.9726 (36)					
Total fabric heat loss						(33) + (36) =	21.9271 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 24.3480	Feb 24.2160	Mar 24.0867	Apr 23.4794	May 23.3658	Jun 22.8368	Jul 22.8368	Aug 22.7389	Sep 23.0406	Oct 23.3658	Nov 23.5957	Dec 23.8360 (38)
Heat transfer coeff	46.2750	46.1431	46.0138	45.4065	45.2928	44.7639	44.7639	44.6659	44.9676	45.2928	45.5227	45.7630 (39)
Average = Sum(39)m / 12 =												45.4059 (39)
HLP	Jan 0.9111	Feb 0.9085	Mar 0.9060	Apr 0.8940	May 0.8918	Jun 0.8814	Jul 0.8814	Aug 0.8794	Sep 0.8854	Oct 0.8918	Nov 0.8963	Dec 0.9010 (40)
HLP (average)												0.8940 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan 82.3820	Feb 79.3863	Mar 76.3906	Apr 73.3949	May 70.3992	Jun 67.4035	Jul 67.4035	Aug 70.3992	Sep 73.3949	Oct 76.3906	Nov 79.3863	Dec 82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
Northeast					6.2400	11.2829	0.6300	0.7000			0.7700	21.5169
East					2.2100	19.6403	0.6300	0.7000			0.7700	13.2651 (75)
Solar gains	34.7820	69.7476	121.6454	191.9199	250.5825	263.9066	248.1742	202.4459	145.8561	84.3160	43.6138	28.4803 (83)
Total gains	354.2501	387.4940	429.6097	484.2714	527.3697	525.4920	499.7608	458.8865	410.2138	364.4577	341.8569	340.0218 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.2201	76.4380	76.6527	77.6780	77.8729	78.7931	78.7931	78.9659	78.4360	77.8729	77.4796	77.0728	
alpha	6.0813	6.0959	6.1102	6.1785	6.1915	6.2529	6.2529	6.2644	6.2291	6.1915	6.1653	6.1382	
util living area	0.9953	0.9909	0.9747	0.9088	0.7488	0.5395	0.3934	0.4461	0.7191	0.9451	0.9895	0.9963	(86)
MIT	20.1876	20.3057	20.5192	20.7880	20.9489	20.9942	20.9993	20.9986	20.9703	20.7544	20.4291	20.1670	(87)
Th 2	20.1581	20.1603	20.1624	20.1726	20.1745	20.1834	20.1834	20.1850	20.1800	20.1745	20.1707	20.1666	(88)
util rest of house	0.9938	0.9880	0.9669	0.8834	0.6970	0.4732	0.3208	0.3680	0.6477	0.9238	0.9858	0.9951	(89)
MIT 2	19.0771	19.2501	19.5579	19.9338	20.1283	20.1798	20.1831	20.1844	20.1581	19.8989	19.4380	19.0536	(90)
Living area fraction	19.6346	19.7801	20.0406	20.3626	20.5403	20.5887	20.5929	20.5932	20.5658	20.3284	19.9356	19.6126	(92)
Temperature adjustment	19.6346	19.7801	20.0406	20.3626	20.5403	20.5887	20.5929	20.5932	20.5658	20.3284	19.9356	19.6126	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9926	0.9864	0.9655	0.8897	0.7207	0.5064	0.3573	0.4073	0.6824	0.9283	0.9844	0.9941	(94)
Ext temp.	351.6359	382.2403	414.7963	430.8673	380.0823	266.1096	178.5526	186.8875	279.9332	338.3293	336.5361	338.0124	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	709.6104	686.6128	623.0524	520.4780	400.4024	268.0769	178.7380	187.2924	290.7535	440.6267	584.3111	705.3274	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	266.3331	204.5383	154.9426	64.5197	15.1182	0.0000	0.0000	0.0000	0.0000	76.1093	178.3980	273.2823	(98)
												1233.2414	(98)
												24.2812	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1318.9747 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	266.3331	204.5383	154.9426	64.5197	15.1182	0.0000	0.0000	0.0000	0.0000	76.1093	178.3980	273.2823	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	284.8482	218.7575	165.7140	69.0050	16.1692	0.0000	0.0000	0.0000	0.0000	81.4003	190.8000	292.2805	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	86.0259	85.6605	84.7812	82.8727	80.7374	79.8000	79.8000	79.8000	79.8000	83.1631	85.2060	86.1526	(216)
Fuel for water heating, kWh/month	196.1793	173.8684	185.0120	170.4054	171.9547	156.2471	150.8144	164.4484	163.8315	176.0477	180.7903	191.4164	(219)
Water heating fuel used												2081.0156	(219)
Annual totals kWh/year													
Space heating fuel - main system												1318.9747	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												3718.3666	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1318.9747	0.2160	284.8985 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2081.0156	0.2160	449.4994 (264)
Space and water heating			734.3979 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			899.6352 (272)
Emissions per m2 for space and water heating			14.4595 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.4595 * 1.00) + 2.4870 + 0.7664, rounded to 2 d.p.			17.7100 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	013	Issued on Date	29/04/2022
Assessment Reference	013	Prop Type Ref	
Property			
SAP Rating	86 B	DER	13.39
Environmental	90 B	TER	14.60
CO ₂ Emissions (t/year)	0.98	% DER<TER	8.29
General Requirements Compliance	Fail	DFEE	33.02
		TFEE	37.84
		% DFEE<TFEE	12.73
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 88 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 14.60 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.39 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)37.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)33.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing North East:	12.71 m ² , No overhang
Windows facing East:	1.37 m ² , No overhang
Windows facing South East:	7.38 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	87.5200 (1b)	x 2.5000 (2b)	= 218.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 218.8000 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							2	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1275 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m2		Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door				1.8900	1.0000	1.8900			(26)				
Window (Uw = 1.20)				21.4600	1.1450	24.5725			(27)				
External Wall	45.5300		21.4600	24.0700	0.1500	3.6105			(29a)				
Corridor	10.9800		1.8900	9.0900	0.2500	2.2725			(29a)				
Total net area of external elements Aum(A, m2)				56.5100					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =		32.3455			(33)				
Party Wall				39.6000	0.0000	0.0000			(32)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K									250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)									8.8400 (36)				
Total fabric heat loss							(33) + (36) =	41.1855	(37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 20.2216	Feb 19.9915	Mar 19.7613	Apr 18.6106	May 18.3804	Jun 17.2297	Jul 17.2297	Aug 16.9995	Sep 17.6900	Oct 18.3804	Nov 18.8407	Dec 19.3010	(38)
Heat transfer coeff													
	61.4072	61.1770	60.9469	59.7961	59.5659	58.4152	58.4152	58.1850	58.8755	59.5659	60.0263	60.4866	(39)
Average = Sum(39)m / 12 =													59.7386 (39)
HLP	Jan 0.7016	Feb 0.6990	Mar 0.6964	Apr 0.6832	May 0.6806	Jun 0.6674	Jul 0.6674	Aug 0.6648	Sep 0.6727	Oct 0.6806	Nov 0.6859	Dec 0.6911	(40)
HLP (average)													0.6826 (40)
Days in month													
	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5902 (42)
Average daily hot water use (litres/day)												95.7180 (43)
Daily hot water use	Jan 105.2898	Feb 101.4611	Mar 97.6323	Apr 93.8036	May 89.9749	Jun 86.1462	Jul 86.1462	Aug 89.9749	Sep 93.8036	Oct 97.6323	Nov 101.4611	Dec 105.2898 (44)
Energy conte	156.1417	136.5625	140.9203	122.8577	117.8849	101.7257	94.2638	108.1691	109.4610	127.5662	139.2485	151.2149 (45)
Energy content (annual)												Total = Sum(45)m = 1506.0165 (45)
Distribution loss (46)m = 0.15 x (45)m												
	23.4213	20.4844	21.1380	18.4287	17.6827	15.2589	14.1396	16.2254	16.4192	19.1349	20.8873	22.6822 (46)
Water storage loss:												

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Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (56)													
If cylinder contains dedicated solar storage													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (57)													
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month													
211.4185 186.4900 196.1971 176.3514 173.1617 155.2194 149.5406 163.4459 162.9547 182.8430 192.7422 206.4917 (62)													
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
211.4185 186.4900 196.1971 176.3514 173.1617 155.2194 149.5406 163.4459 162.9547 182.8430 192.7422 206.4917 (64)													
Total per year (kWh/year) = Sum(64)m =													2156.8562 (64)
Heat gains from water heating, kWh/month													
96.1386 85.3490 91.0774 83.6451 83.4182 76.6187 75.5642 80.1877 79.1907 86.6372 89.0951 94.5004 (65)													

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
(66)m 129.5115 129.5115 129.5115 129.5115 129.5115 129.5115 129.5115 129.5115 129.5115 129.5115 129.5115 129.5115 (66)													
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
20.9005 18.5637 15.0970 11.4294 8.5436 7.2129 7.7938 10.1306 13.5973 17.2649 20.1507 21.4814 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
234.4405 236.8732 230.7428 217.6917 201.2171 185.7333 175.3892 172.9564 179.0869 192.1379 208.6125 224.0963 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
35.9512 35.9512 35.9512 35.9512 35.9512 35.9512 35.9512 35.9512 35.9512 35.9512 35.9512 35.9512 (69)													
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													
-103.6092 -103.6092 -103.6092 -103.6092 -103.6092 -103.6092 -103.6092 -103.6092 -103.6092 -103.6092 -103.6092 -103.6092 (71)													
Water heating gains (Table 5)													
129.2185 127.0074 122.4159 116.1738 112.1212 106.4149 101.5647 107.7791 109.9871 116.4479 123.7432 127.0167 (72)													
Total internal gains													
446.4130 444.2978 430.1091 407.1484 383.7354 361.2145 346.6011 352.7196 364.5248 387.7042 414.3599 434.4479 (73)													

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
Northeast				12.7100	11.2829	0.4000	0.8000		0.7700		31.8018 (75)	
East				1.3700	19.6403	0.4000	0.8000		0.7700		5.9669 (76)	
Southeast				7.3800	36.7938	0.4000	0.8000		0.7700		60.2164 (77)	
Solar gains	97.9851	178.9767	276.1939	393.4643	486.5955	503.0205	476.6833	404.3119	316.4320	206.3224	119.5802	82.4105 (83)
Total gains	544.3980	623.2745	706.3030	800.6127	870.3309	864.2350	823.2844	757.0316	680.9567	594.0265	533.9401	516.8584 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	98.9751	99.3474	99.7226	101.6417	102.0344	104.0445	104.0445	104.4560	103.2310	102.0344	101.2520	100.4815	
alpha	7.5983	7.6232	7.6482	7.7761	7.8023	7.9363	7.9363	7.9637	7.8821	7.8023	7.7501	7.6988	
util living area													
	0.9962	0.9886	0.9577	0.8365	0.6296	0.4323	0.3122	0.3535	0.5924	0.9041	0.9884	0.9973 (86)	
MIT	20.4354	20.5688	20.7576	20.9368	20.9929	20.9997	21.0000	20.9999	20.9967	20.9033	20.6406	20.4137 (87)	
Th 2	20.3394	20.3417	20.3440	20.3557	20.3580	20.3697	20.3697	20.3720	20.3650	20.3580	20.3533	20.3487 (88)	
util rest of house													
	0.9950	0.9853	0.9467	0.8063	0.5884	0.3898	0.2675	0.3053	0.5397	0.8765	0.9846	0.9965 (89)	
MIT 2	19.5808	19.7757	20.0441	20.2879	20.3519	20.3695	20.3697	20.3720	20.3627	20.2539	19.8901	19.5568 (90)	
Living area fraction									fLA = Living area / (4) =			0.1862 (91)	
MIT	19.7400	19.9234	20.1770	20.4088	20.4712	20.4868	20.4871	20.4889	20.4808	20.3748	20.0298	19.7164 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.7400	19.9234	20.1770	20.4088	20.4712	20.4868	20.4871	20.4889	20.4808	20.3748	20.0298	19.7164 (93)	

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8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	1207.6290	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1268.0105	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	2156.8562	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2264.6990	(310a)
Electricity used for heat distribution	35.3271	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	210.2121	(330a)
Total electricity for the above, kWh/year	210.2121	(331)
Electricity for lighting (calculated in Appendix L)	369.1100	(332)
Total delivered energy for all uses	4112.0316	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Boilers			89.5000	(367a)
Space heating from Boilers	3947.1615	0.2160	852.5869	(367)
Electrical energy for heat distribution	35.3271	0.5190	18.3348	(372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			870.9216	(373)
Space and water heating			870.9216	(376)
Pumps and fans	210.2121	0.5190	109.1001	(378)
Energy for lighting	369.1100	0.5190	191.5681	(379)
Total CO2, kg/year			1171.5898	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			13.3900	(384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		13.3900	ZC1
Total Floor Area	TFA	87.5200	
Assumed number of occupants	N	2.5902	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		15.8735	ZC2
CO2 emissions from cooking, equation (L16)		2.0700	ZC3
Total CO2 emissions		31.3334	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		31.3334	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	87.5200 (1b)	x 2.5000 (2b)	= 218.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 218.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 30.0000 / (5) = 0.1371 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3871 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3290 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4195	0.4113	0.4031	0.3619	0.3537	0.3126	0.3126	0.3044	0.3290	0.3537	0.3702	0.3866 (22b)
	0.5880	0.5846	0.5812	0.5655	0.5626	0.5489	0.5489	0.5463	0.5541	0.5626	0.5685	0.5747 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			20.0000	1.3258	26.5152		(27)
External Wall	45.5300	20.0000	25.5300	0.1800	4.5954		(29a)
Corridor	10.9800	1.8900	9.0900	0.1800	1.6362		(29a)
Total net area of external elements Aum(A, m ²)			56.5100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.6368		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.5990 (36)
Total fabric heat loss						(33) + (36) =	41.2358 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	42.4562	42.2095	41.9676	40.8316	40.6191	39.6297	39.6297
Heat transfer coeff	83.6920	83.4452	83.2034	82.0674	81.8548	80.8654	80.8654
Average = Sum(39)m / 12 =							
HLP	0.9563	0.9534	0.9507	0.9377	0.9353	0.9240	0.9240
HLP (average)							
Days in month	31	28	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5902 (42)
Average daily hot water use (litres/day)												95.7180 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	105.2898	101.4611	97.6323	93.8036	89.9749	86.1462	86.1462	89.9749	93.8036	97.6323	101.4611	105.2898 (44)
Energy conte	156.1417	136.5625	140.9203	122.8577	117.8849	101.7257	94.2638	108.1691	109.4610	127.5662	139.2485	151.2149 (45)
Energy content (annual)										Total = Sum(45)m =		1506.0165 (45)
Distribution loss (46)m = 0.15 x (45)m												
	23.4213	20.4844	21.1380	18.4287	17.6827	15.2589	14.1396	16.2254	16.4192	19.1349	20.8873	22.6822 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

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If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	202.7366	178.6482	187.5152	167.9496	164.4798	146.8176	140.8587	154.7640	154.5528	174.1611	184.3404	197.8098 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	202.7366	178.6482	187.5152	167.9496	164.4798	146.8176	140.8587	154.7640	154.5528	174.1611	184.3404	197.8098 (64)
	89.1930	79.0756	84.1319	76.9237	76.4727	69.8973	68.6186	73.2422	72.4693	79.6917	82.3736	87.5549 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.9005	18.5637	15.0970	11.4294	8.5436	7.2129	7.7938	10.1306	13.5973	17.2649	20.1507	21.4814	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	234.4405	236.8732	230.7428	217.6917	201.2171	185.7333	175.3892	172.9564	179.0869	192.1379	208.6125	224.0963	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	(71)
Water heating gains (Table 5)	119.8831	117.6720	113.0805	106.8384	102.7858	97.0795	92.2294	98.4438	100.6517	107.1125	114.4078	117.6813	(72)
Total internal gains	440.0776	437.9624	423.7737	400.8130	377.4000	354.8792	340.2657	346.3842	358.1894	381.3688	408.0245	428.1125	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W

Northeast					11.8500	11.2829	0.6300	0.7000			0.7700			40.8613 (75)
East					1.2800	19.6403	0.6300	0.7000			0.7700			7.6830 (76)
Southeast					6.8700	36.7938	0.6300	0.7000			0.7700			77.2509 (77)

Solar gains	125.7952	229.7908	354.6482	505.2835	624.9212	646.0304	612.1995	519.2294	406.3346	264.9111	153.5227	105.7982	(83)	
Total gains	565.8728	667.7532	778.4220	906.0965	1002.3212	1000.9095	952.4653	865.6137	764.5240	646.2798	561.5471	533.9107	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.6208	72.8355	73.0473	74.0584	74.2507	75.1592	75.1592	75.3298	74.8066	74.2507	73.8627	73.4614	
alpha	5.8414	5.8557	5.8698	5.9372	5.9500	6.0106	6.0106	6.0220	5.9871	5.9500	5.9242	5.8974	
util living area	0.9970	0.9915	0.9715	0.8920	0.7178	0.5123	0.3729	0.4273	0.6988	0.9452	0.9924	0.9978	(86)
MIT	20.0729	20.2417	20.4987	20.7937	20.9533	20.9946	20.9993	20.9985	20.9705	20.7315	20.3457	20.0445	(87)
Th 2	20.1199	20.1223	20.1246	20.1356	20.1376	20.1472	20.1472	20.1489	20.1435	20.1376	20.1335	20.1292	(88)
util rest of house	0.9960	0.9889	0.9627	0.8632	0.6638	0.4462	0.3010	0.3490	0.6253	0.9235	0.9896	0.9971	(89)
MIT 2	18.8811	19.1281	19.4980	19.9068	20.0962	20.1439	20.1469	20.1484	20.1222	19.8369	19.2890	18.8468	(90)
Living area fraction									fLA = Living area / (4) =			0.1862	(91)
MIT	19.1031	19.3355	19.6844	20.0720	20.2558	20.3023	20.3057	20.3067	20.2802	20.0035	19.4858	19.0698	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1031	19.3355	19.6844	20.0720	20.2558	20.3023	20.3057	20.3067	20.2802	20.0035	19.4858	19.0698	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9944	0.9857	0.9572	0.8609	0.6715	0.4583	0.3144	0.3636	0.6376	0.9194	0.9866	0.9959	(94)
Ext temp.	562.6971	658.1824	745.0856	780.0157	673.0856	458.7542	299.4652	314.7449	487.4354	594.1894	554.0450	531.7041	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1238.8988	1204.5768	1096.9828	916.8572	700.3367	461.1229	299.6620	315.2023	502.1211	769.7211	1019.1637	1230.2454	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	503.0941	367.1770	261.8115	98.5259	20.2748	0.0000	0.0000	0.0000	0.0000	130.5956	334.8855	519.7147	(98)
Space heating per m2												2236.0790	(98)
										(98) / (4) =		25.5493	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2391.5284 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	503.0941	367.1770	261.8115	98.5259	20.2748	0.0000	0.0000	0.0000	0.0000	130.5956	334.8855	519.7147	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	538.0685	392.7027	280.0123	105.3753	21.6843	0.0000	0.0000	0.0000	0.0000	139.6745	358.1663	555.8446	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	202.7366	178.6482	187.5152	167.9496	164.4798	146.8176	140.8587	154.7640	154.5528	174.1611	184.3404	197.8098	(64)
Efficiency of water heater (217)m	87.1438	86.6953	85.7042	83.4479	80.8490	79.8000	79.8000	79.8000	79.8000	84.0589	86.3876	79.8000	(216)
Fuel for water heating, kWh/month	232.6461	206.0645	218.7934	201.2628	203.4408	183.9819	176.5147	193.9399	193.6752	207.1895	213.3876	226.6540	(219)
Water heating fuel used												2457.5502	(219)
Annual totals kWh/year													
Space heating fuel - main system												2391.5284	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												369.1100	(232)
Total delivered energy for all uses												5293.1887	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2391.5284	0.2160	516.5701 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2457.5502	0.2160	530.8309 (264)
Space and water heating			1047.4010 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	369.1100	0.5190	191.5681 (268)
Total CO2, kg/m2/year			1277.8941 (272)
Emissions per m2 for space and water heating			11.9676 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.1888 (272b)
Emissions per m2 for pumps and fans			0.4448 (272c)
Target Carbon Dioxide Emission Rate (TER) = (11.9676 * 1.00) + 2.1888 + 0.4448, rounded to 2 d.p.			14.6000 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	014			Issued on Date	29/04/2022
Assessment Reference	014	Prop Type Ref			
Property					
SAP Rating	86 B	DER	13.18	TER	14.12
Environmental	90 B	% DER<TER	6.63		
CO ₂ Emissions (t/year)	0.96	DFEE	31.54	TFEE	33.84
General Requirements Compliance	Pass	% DFEE<TFEE	6.81		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 87 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 14.12 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.18 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)33.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)31.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing South East:	1.97 m ² , No overhang
Windows facing South:	3.92 m ² , No overhang
Windows facing South West:	8.41 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	87.0000 (1b)	x 2.5000 (2b)	= 217.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 217.5000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			14.3000	1.1450	16.3740		(27)
External Wall	44.9800	14.3000	30.6800	0.1500	4.6020		(29a)
Corridor	15.5500	1.8900	13.6600	0.2500	3.4150		(29a)
Core	18.2300		18.2300	0.2500	4.5575		(29a)
Total net area of external elements Aum(A, m ²)			78.7600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	30.8385			(33)
Party Wall			18.8500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.7380 (36)
Total fabric heat loss							(33) + (36) = 40.5765 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	20.1015	19.8727	19.6439	18.5000	18.2712	17.1273	17.1273	16.8985	17.5849	18.2712	18.7288	19.1864 (38)
Heat transfer coeff	60.6780	60.4492	60.2205	59.0766	58.8478	57.7039	57.7039	57.4751	58.1614	58.8478	59.3053	59.7629 (39)
Average = Sum(39)m / 12 =												59.0194 (39)
HLP	0.6974	0.6948	0.6922	0.6790	0.6764	0.6633	0.6633	0.6606	0.6685	0.6764	0.6817	0.6869 (40)
HLP (average)												0.6784 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5824 (42)
Average daily hot water use (litres/day)												95.5318 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	105.0850	101.2637	97.4424	93.6211	89.7999	85.9786	85.9786	89.7999	93.6211	97.4424	101.2637	105.0850 (44)
Energy conte	155.8380	136.2969	140.6462	122.6187	117.6556	101.5278	94.0805	107.9587	109.2481	127.3181	138.9777	150.9207 (45)
Energy content (annual)												Total = Sum(45)m = 1503.0869 (45)
Distribution loss (46)m = 0.15 x (45)m	23.3757	20.4445	21.0969	18.3928	17.6483	15.2292	14.1121	16.1938	16.3872	19.0977	20.8466	22.6381 (46)

Water storage loss:												110.0000 (47)
Store volume												
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144												(56)
If cylinder contains dedicated solar storage												
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144												(57)
Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624												(59)
Total heat required for water heating calculated for each month												
211.1148 186.2243 195.9230 176.1124 172.9324 155.0215 149.3573 163.2355 162.7418 182.5949 192.4713 206.1975												(62)
Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000												(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
211.1148 186.2243 195.9230 176.1124 172.9324 155.0215 149.3573 163.2355 162.7418 182.5949 192.4713 206.1975												(64)
Total per year (kWh/year) = Sum(64)m =												2153.9267 (64)
Heat gains from water heating, kWh/month												
96.0376 85.2607 90.9863 83.5657 83.3419 76.5529 75.5032 80.1177 79.1199 86.5547 89.0050 94.4026												(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.1208	18.7593	15.2561	11.5499	8.6337	7.2889	7.8759	10.2374	13.7406	17.4469	20.3631	21.7078 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	233.4490	235.8715	229.7669	216.7711	200.3661	184.9478	174.6474	172.2249	178.3295	191.3253	207.7303	223.1486 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956 (71)
Water heating gains (Table 5)	129.0827	126.8760	122.2934	116.0634	112.0187	106.3235	101.4828	107.6851	109.8888	116.3370	123.6181	126.8852 (72)
Total internal gains	445.3884	443.2426	429.0523	406.1202	382.7544	360.2961	345.7420	351.8833	363.6948	386.8451	413.4473	433.4775 (73)

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Southeast				1.9700	36.7938	0.4000	0.8000	0.7700	16.0740 (77)			
South				3.9200	46.7521	0.4000	0.8000	0.7700	40.6415 (78)			
Southwest				8.4100	36.7938	0.4000	0.8000	0.7700	68.6206 (79)			
Solar gains	125.3361	210.8266	282.1774	340.4041	373.8044	368.0651	356.0989	331.4779	302.3021	231.2365	149.6187	107.5989 (83)
Total gains	570.7245	654.0692	711.2297	746.5243	756.5588	728.3612	701.8409	683.3612	665.9969	618.0815	563.0660	541.0764 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	99.5693	99.9461	100.3258	102.2684	102.6660	104.7013	104.7013	105.1180	103.8776	102.6660	101.8739	101.0939
alpha	7.6380	7.6631	7.6884	7.8179	7.8444	7.9801	7.9801	8.0079	7.9252	7.8444	7.7916	7.7396
util living area	0.9945	0.9839	0.9539	0.8664	0.7067	0.5059	0.3617	0.3868	0.5982	0.8825	0.9832	0.9961 (86)
MIT	20.4756	20.6119	20.7707	20.9197	20.9850	20.9990	20.9999	20.9999	20.9966	20.9214	20.6805	20.4518 (87)
Th 2	20.3431	20.3454	20.3477	20.3594	20.3617	20.3734	20.3734	20.3757	20.3687	20.3617	20.3571	20.3524 (88)
util rest of house	0.9929	0.9795	0.9422	0.8388	0.6635	0.4569	0.3102	0.3344	0.5453	0.8519	0.9778	0.9950 (89)
MIT 2	19.6422	19.8402	20.0652	20.2715	20.3483	20.3728	20.3734	20.3757	20.3663	20.2788	19.9497	19.6152 (90)
Living area fraction									FLA = Living area / (4) =			0.1782 (91)
MIT	19.7907	19.9777	20.1909	20.3870	20.4618	20.4844	20.4850	20.4869	20.4786	20.3933	20.0799	19.7642 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7907	19.9777	20.1909	20.3870	20.4618	20.4844	20.4850	20.4869	20.4786	20.3933	20.0799	19.7642 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9912	0.9765	0.9390	0.8400	0.6704	0.4656	0.3194	0.3437	0.5546	0.8535	0.9749	0.9936 (94)
Useful gains	565.6949	638.6731	667.8410	627.1151	507.2150	339.1393	224.1628	234.8654	369.3873	527.5620	548.9363	537.6294 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	939.9424	911.4372	824.4731	678.6113	515.6099	339.5503	224.1797	234.8952	370.9875	576.3134	769.7764	930.1630 (97)
Month fracti	1.0000	1.0000	1.0000		1.0000	0.0000	0.0000	0.0000	0.0000	1.0000		1.0000 (97a)
Space heating kWh	278.4401	183.2975	116.5343	37.0773	6.2458	0.0000	0.0000	0.0000	0.0000	36.2710	159.0049	292.0450 (98)
Space heating												1108.9159 (98)
Space heating per m2												12.7462 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	1108.9159	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1164.3617	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating:		
Annual water heating requirement	2153.9267	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2261.6230	(310a)
Electricity used for heat distribution	34.2598	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	208.9631	(330a)
Total electricity for the above, kWh/year	208.9631	(331)
Electricity for lighting (calculated in Appendix L)	373.0005	(332)
Total delivered energy for all uses	4007.9483	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3827.9159	0.2160	826.8298 (367)
Electrical energy for heat distribution	34.2598	0.5190	17.7809 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			844.6107 (373)
Space and water heating			844.6107 (376)
Pumps and fans	208.9631	0.5190	108.4519 (378)
Energy for lighting	373.0005	0.5190	193.5872 (379)
Total CO2, kg/year			1146.6498 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			13.1800 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		13.1800	ZC1
Total Floor Area	TFA	87.0000	
Assumed number of occupants	N	2.5824	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		15.9008	ZC2
CO2 emissions from cooking, equation (L16)		2.0802	ZC3
Total CO2 emissions		31.1610	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		31.1610	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	87.0000 (1b)	x 2.5000 (2b)	= 217.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 217.5000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1379 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3879 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3297 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4204	0.4122	0.4039	0.3627	0.3545	0.3133	0.3133	0.3050	0.3297	0.3545	0.3710	0.3874 (22b)
	0.5884	0.5849	0.5816	0.5658	0.5628	0.5491	0.5491	0.5465	0.5544	0.5628	0.5688	0.5751 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			14.3000	1.3258	18.9583		(27)
External Wall	44.9800	14.3000	30.6800	0.1800	5.5224		(29a)
Corridor	15.5500	1.8900	13.6600	0.1800	2.4588		(29a)
Core	18.2300		18.2300	0.1800	3.2814		(29a)
Total net area of external elements Aum(A, m ²)			78.7600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.1109		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.3160 (36)
Total fabric heat loss						(33) + (36) =	39.4269 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	42.2307	41.9844	41.7430	40.6090	40.3968	39.4091	39.4091	39.2262	39.7895	40.3968	40.8260	41.2747 (38)
Heat transfer coeff	81.6577	81.4113	81.1699	80.0359	79.8237	78.8360	78.8360	78.6531	79.2165	79.8237	80.2529	80.7017 (39)
Average = Sum(39)m / 12 =												80.0349 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9386	0.9358	0.9330	0.9200	0.9175	0.9062	0.9062	0.9041	0.9105	0.9175	0.9224	0.9276 (40)
HLP (average)												0.9199 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5824 (42)
Average daily hot water use (litres/day)												95.5318 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	105.0850	101.2637	97.4424	93.6211	89.7999	85.9786	85.9786	89.7999	93.6211	97.4424	101.2637	105.0850 (44)
Energy conte	155.8380	136.2969	140.6462	122.6187	117.6556	101.5278	94.0805	107.9587	109.2481	127.3181	138.9777	150.9207 (45)
Energy content (annual)										Total = Sum(45)m =		1503.0869 (45)
Distribution loss (46)m = 0.15 x (45)m	23.3757	20.4445	21.0969	18.3928	17.6483	15.2292	14.1121	16.1938	16.3872	19.0977	20.8466	22.6381 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	202.4329	178.3826	187.2411	167.7106	164.2505	146.6197	140.6754	154.5536	154.3399	173.9130	184.0695	197.5156 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	202.4329	178.3826	187.2411	167.7106	164.2505	146.6197	140.6754	154.5536	154.3399	173.9130	184.0695	197.5156 (64)
Heat gains from water heating, kWh/month	89.0920	78.9873	84.0408	76.8442	76.3964	69.8315	68.5577	73.1722	72.3985	79.6092	82.2835	87.4571 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195 (66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.5997	19.1847	15.6020	11.8117	8.8294	7.4542	8.0545	10.4695	14.0522	17.8425	20.8248	22.2000 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	233.4490	235.8715	229.7669	216.7711	200.3661	184.9478	174.6474	172.2249	178.3295	191.3253	207.7303	223.1486 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120 (69)	
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)	
Losses e.g. evaporation (negative values) (Table 5)	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956 (71)	
Water heating gains (Table 5)	119.7474	117.5406	112.9580	106.7281	102.6833	96.9882	92.1474	98.3497	100.5534	107.0016	114.2827	117.5498 (72)	
Total internal gains	439.5320	437.3326	423.0628	400.0467	376.6147	354.1260	339.5852	345.7801	357.6709	380.9053	407.5736	427.6343 (73)	

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
Southeast					1.9700	36.7938	0.6300	0.7000	0.7700		22.1520 (77)	
South					3.9200	46.7521	0.6300	0.7000	0.7700		56.0091 (78)	
Southwest					8.4100	36.7938	0.6300	0.7000	0.7700		94.5677 (79)	
Solar gains	172.7288	290.5453	388.8757	469.1194	515.1492	507.2397	490.7488	456.8180	416.6101	318.6728	206.1932	148.2848 (83)
Total gains	612.2608	727.8780	811.9386	869.1661	891.7639	861.3657	830.3340	802.5980	774.2810	699.5780	613.7669	575.9191 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.9877	74.2116	74.4323	75.4870	75.6876	76.6359	76.6359	76.8141	76.2678	75.6876	75.2828	74.8642	
alpha	5.9325	5.9474	5.9622	6.0325	6.0458	6.1091	6.1091	6.1209	6.0845	6.0458	6.0189	5.9909	
util living area	0.9952	0.9863	0.9633	0.8998	0.7690	0.5763	0.4166	0.4489	0.6787	0.9202	0.9875	0.9966 (86)	
MIT	20.1531	20.3341	20.5563	20.7900	20.9362	20.9908	20.9989	20.9983	20.9762	20.7899	20.4263	20.1204 (87)	
Th 2	20.1348	20.1372	20.1396	20.1506	20.1526	20.1623	20.1623	20.1641	20.1586	20.1526	20.1485	20.1441 (88)	
util rest of house	0.9937	0.9822	0.9525	0.8725	0.7169	0.5050	0.3379	0.3683	0.6066	0.8922	0.9830	0.9955 (89)	
MIT 2	19.0090	19.2725	19.5902	19.9161	20.0942	20.1565	20.1619	20.1634	20.1416	19.9243	19.4164	18.9686 (90)	
Living area fraction	19.2129	19.4617	19.7623	20.0718	20.2442	20.3051	20.3110	20.3121	20.2902	20.0785	19.5963	19.1738 (92)	
Temperature adjustment	19.2129	19.4617	19.7623	20.0718	20.2442	20.3051	20.3110	20.3121	20.2902	20.0785	19.5963	19.1738 (92)	
adjusted MIT	19.2129	19.4617	19.7623	20.0718	20.2442	20.3051	20.3110	20.3121	20.2902	20.0785	19.5963	19.1738 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	607.0654	711.8943	768.7470	755.8795	644.6731	445.6694	292.2355	307.1626	478.7495	622.1981	600.9603	572.3427 (95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W	1217.7494	1185.4847	1076.5023	894.1435	682.0332	449.7677	292.5592	307.6997	490.3696	756.6071	1002.8635	1208.4088 (97)	
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)	
Space heating kWh	454.3489	318.2527	228.9699	99.5501	27.7959	0.0000	0.0000	0.0000	0.0000	100.0003	289.3703	473.2332 (98)	
Space heating												1991.5213 (98)	
Space heating per m2												22.8910 (99)	

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2129.9693 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	454.3489	318.2527	228.9699	99.5501	27.7959	0.0000	0.0000	0.0000	0.0000	100.0003	289.3703	473.2332	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	485.9346	340.3772	244.8876	106.4707	29.7282	0.0000	0.0000	0.0000	0.0000	106.9522	309.4870	506.1317	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	202.4329	178.3826	187.2411	167.7106	164.2505	146.6197	140.6754	154.5536	154.3399	173.9130	184.0695	197.5156	(64)
Efficiency of water heater (217)m	86.9083	86.3417	85.3515	83.4762	81.1893	79.8000	79.8000	79.8000	79.8000	83.3999	86.0159	87.0624	(216)
Fuel for water heating, kWh/month	232.9270	206.6008	219.3764	200.9081	202.3055	183.7339	176.2849	193.6762	193.4084	208.5291	213.9948	226.8667	(219)
Water heating fuel used												2458.6118	(219)
Annual totals kWh/year													
Space heating fuel - main system												2129.9693	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												381.4579	(232)
Total delivered energy for all uses												5045.0390	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2129.9693	0.2160	460.0734 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2458.6118	0.2160	531.0602 (264)
Space and water heating			991.1335 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	381.4579	0.5190	197.9766 (268)
Total CO2, kg/m2/year			1228.0352 (272)
Emissions per m2 for space and water heating			11.3923 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2756 (272b)
Emissions per m2 for pumps and fans			0.4474 (272c)
Target Carbon Dioxide Emission Rate (TER) = (11.3923 * 1.00) + 2.2756 + 0.4474, rounded to 2 d.p.			14.1200 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	015	Issued on Date	29/04/2022
Assessment Reference	015	Prop Type Ref	
Property			
SAP Rating	85 B	DER	14.21
Environmental	89 B	TER	15.15
CO ₂ Emissions (t/year)	0.88	% DER<TER	6.22
General Requirements Compliance	Pass	DFEE	33.34
		TFEE	34.60
		% DFEE<TFEE	3.65
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 15.15 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.21 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)34.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)33.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.23 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading: Average
Windows facing South West: 12.10 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.1200 (1b)	x 2.5000 (2b)	= 182.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 182.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			12.1000	1.1450	13.8550		(27)
External Wall	25.1000	12.1000	13.0000	0.1500	1.9500		(29a)
Corridor	25.1000	1.8900	23.2100	0.2500	5.8025		(29a)
Core	18.2300		18.2300	0.2500	4.5575		(29a)
Total net area of external elements Aum(A, m ²)			68.4300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	28.0550			(33)
Party Wall			18.2300	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.1230 (36)
Total fabric heat loss						(33) + (36) =	36.1780 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	16.0292	15.8539	15.6786	14.8020	14.6267	13.7501	13.7501	13.5748	14.1007	14.6267	14.9773	15.3280 (38)
Heat transfer coeff	52.2072	52.0319	51.8565	50.9800	50.8046	49.9281	49.9281	49.7527	50.2787	50.8046	51.1553	51.5059 (39)
Average = Sum(39)m / 12 =												50.9361 (39)
HLP	0.7140	0.7116	0.7092	0.6972	0.6948	0.6828	0.6828	0.6804	0.6876	0.6948	0.6996	0.7044 (40)
HLP (average)												0.6966 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3194 (42)
Average daily hot water use (litres/day)												89.2864 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	98.2150	94.6436	91.0721	87.5007	83.9292	80.3578	80.3578	83.9292	87.5007	91.0721	94.6436	98.2150 (44)
Energy conte	145.6501	127.3865	131.4514	114.6025	109.9639	94.8905	87.9300	100.9009	102.1060	118.9947	129.8920	141.0543 (45)
Energy content (annual)										Total = Sum(45)m =		1404.8227 (45)
Distribution loss (46)m = 0.15 x (45)m	21.8475	19.1080	19.7177	17.1904	16.4946	14.2336	13.1895	15.1351	15.3159	17.8492	19.4838	21.1581 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Water storage loss:												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
200.9269	177.3139	186.7282	168.0962	165.2407	148.3841	143.2068	156.1777	155.5997	174.2715	183.3857	196.3311	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
200.9269	177.3139	186.7282	168.0962	165.2407	148.3841	143.2068	156.1777	155.5997	174.2715	183.3857	196.3311	(64)
Heat gains from water heating, kWh/month												
92.6501	82.2979	87.9290	80.9003	80.7844	74.3460	73.4582	77.7710	76.7452	83.7872	85.9840	91.1220	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
18.4814	16.4151	13.3496	10.1065	7.5547	6.3780	6.8917	8.9581	12.0235	15.2666	17.8184	18.9951	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
204.4667	206.5884	201.2418	189.8593	175.4910	161.9869	152.9652	150.8435	156.1902	167.5726	181.9409	195.4451	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	(71)
Water heating gains (Table 5)												
124.5297	122.4672	118.1842	112.3615	108.5812	103.2584	98.7341	104.5309	106.5905	112.6172	119.4223	122.4758	(72)
Total internal gains	405.2693	403.2621	390.5670	370.1188	349.4184	329.4147	316.3824	322.1239	332.5957	353.2478	376.9730	394.7074 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W	
-----					12.1000	36.7938	0.4000	0.8000			0.7700	98.7287 (79)	

Solar gains	98.7287	168.1716	230.0997	285.1047	319.3410	317.0317	305.6524	280.1105	249.1493	185.8654	118.2543	84.4912 (83)	
Total gains	503.9980	571.4337	620.6667	655.2234	668.7594	646.4463	622.0348	602.2345	581.7449	539.1133	495.2273	479.1986 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	97.2621	97.5898	97.9197	99.6034	99.9471	101.7019	101.7019	102.0602	100.9926	99.9471	99.2620	98.5863
alpha	7.4841	7.5060	7.5280	7.6402	7.6631	7.7801	7.7801	7.8040	7.7328	7.6631	7.6175	7.5724
util living area	0.9930	0.9813	0.9489	0.8559	0.6913	0.4933	0.3531	0.3799	0.5919	0.8755	0.9798	0.9949 (86)
MIT	20.4818	20.6134	20.7724	20.9215	20.9857	20.9991	20.9999	20.9999	20.9964	20.9210	20.6840	20.4569 (87)
Th 2	20.3285	20.3306	20.3327	20.3433	20.3454	20.3560	20.3560	20.3582	20.3518	20.3454	20.3412	20.3369 (88)
util rest of house	0.9909	0.9762	0.9361	0.8269	0.6475	0.4441	0.3015	0.3270	0.5382	0.8436	0.9735	0.9934 (89)
MIT 2	19.6391	19.8296	20.0539	20.2580	20.3328	20.3554	20.3560	20.3581	20.3492	20.2627	19.9410	19.6099 (90)
Living area fraction									fLA = Living area / (4) =			0.3747 (91)
MIT	19.9549	20.1233	20.3231	20.5067	20.5774	20.5966	20.5973	20.5986	20.5917	20.5094	20.2194	19.9273 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9549	20.1233	20.3231	20.5067	20.5774	20.5966	20.5973	20.5986	20.5917	20.5094	20.2194	19.9273 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9895	0.9744	0.9359	0.8345	0.6633	0.4625	0.3208	0.3468	0.5582	0.8521	0.9721	0.9922 (94)
Useful gains	498.7262	556.7998	580.8575	546.7654	443.5951	298.9958	199.5582	208.8569	324.7431	459.3768	481.4041	475.4832 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	817.2962	792.0981	716.8183	591.7072	451.0155	299.3993	199.5777	208.8921	326.3954	503.4425	671.1285	810.0477 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	237.0160	158.1204	101.1548	32.3581	5.5207	0.0000	0.0000	0.0000	0.0000	32.7848	136.6016	248.9160 (98)
Space heating												952.4725 (98)
Space heating per m2												(98) / (4) = 13.0262 (99)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	952.4725	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1000.0962	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	2055.6625	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2158.4456	(310a)
Electricity used for heat distribution	31.5854	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	175.6251	(330a)
Total electricity for the above, kWh/year	175.6251	(331)
Electricity for lighting (calculated in Appendix L)	326.3881	(332)
Total delivered energy for all uses	3660.5549	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3529.0969	0.2160	762.2849 (367)
Electrical energy for heat distribution	31.5854	0.5190	16.3928 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			778.6778 (373)
Space and water heating			778.6778 (376)
Pumps and fans	175.6251	0.5190	91.1494 (378)
Energy for lighting	326.3881	0.5190	169.3954 (379)
Total CO2, kg/year			1039.2226 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.2100 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER	14.2100	ZC1
Total Floor Area	73.1200	TFA
Assumed number of occupants	2.3194	N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	EF
CO2 emissions from appliances, equation (L14)	16.5704	ZC2
CO2 emissions from cooking, equation (L16)	2.3888	ZC3
Total CO2 emissions	33.1691	ZC4
Residual CO2 emissions offset from biofuel CHP	0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year	0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000	ZC7
Net CO2 emissions	33.1691	ZC8

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.1200 (1b)	x 2.5000 (2b)	= 182.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 182.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1641 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4141 (18)
Number of sides sheltered					3 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3209 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.4092	0.4012	0.3931	0.3530	0.3450	0.3049	0.3049	0.2969	0.3209	0.3450	0.3611	0.3771 (22b)
Effective ac	0.5837	0.5805	0.5773	0.5623	0.5595	0.5465	0.5465	0.5441	0.5515	0.5595	0.5652	0.5711 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			12.1000	1.3258	16.0417		(27)
External Wall	25.1000	12.1000	13.0000	0.1800	2.3400		(29a)
Corridor	25.1000	1.8900	23.2100	0.1800	4.1778		(29a)
Core	18.2300		18.2300	0.1800	3.2814		(29a)
Total net area of external elements Aum(A, m ²)			68.4300				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 27.7309		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.0308 (36)
Total fabric heat loss							(33) + (36) = 33.7617 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	35.2124	35.0163	34.8240	33.9211	33.7522	32.9658	32.9658	32.8202	33.2687	33.7522	34.0939	34.4512 (38)
Heat transfer coeff	68.9740	68.7779	68.5857	67.6828	67.5139	66.7275	66.7275	66.5819	67.0304	67.5139	67.8556	68.2129 (39)
Average = Sum(39)m / 12 =												67.6820 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9433	0.9406	0.9380	0.9256	0.9233	0.9126	0.9126	0.9106	0.9167	0.9233	0.9280	0.9329 (40)
HLP (average)												0.9256 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3194 (42)
Average daily hot water use (litres/day)												89.2864 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	98.2150	94.6436	91.0721	87.5007	83.9292	80.3578	80.3578	83.9292	87.5007	91.0721	94.6436	98.2150 (44)
Energy conte	145.6501	127.3865	131.4514	114.6025	109.9639	94.8905	87.9300	100.9009	102.1060	118.9947	129.8920	141.0543 (45)
Energy content (annual)										Total = Sum(45)m =		1404.8227 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.8475	19.1080	19.7177	17.1904	16.4946	14.2336	13.1895	15.1351	15.3159	17.8492	19.4838	21.1581 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	192.2450	169.4722	178.0463	159.6944	156.5588	139.9823	134.5249	147.4958	147.1978	165.5896	174.9838	187.6492 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	192.2450	169.4722	178.0463	159.6944	156.5588	139.9823	134.5249	147.4958	147.1978	165.5896	174.9838	187.6492 (64)
Heat gains from water heating, kWh/month	85.7046	76.0246	80.9835	74.1788	73.8389	67.6245	66.5126	70.8255	70.0237	76.8417	79.2626	84.1765 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.8939	16.7814	13.6476	10.3321	7.7234	6.5204	7.0455	9.1580	12.2919	15.6074	18.2161	19.4191 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.4667	206.5884	201.2418	189.8593	175.4910	161.9869	152.9652	150.8435	156.1902	167.5726	181.9409	195.4451 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771 (71)
Water heating gains (Table 5)	115.1943	113.1318	108.8488	103.0261	99.2458	93.9230	89.3987	95.1955	97.2552	103.2818	110.0869	113.1404 (72)
Total internal gains	399.3464	397.2931	384.5296	364.0090	343.2516	323.2216	310.2009	315.9885	326.5286	347.2532	371.0353	388.7960 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
Southwest				12.1000	36.7938	0.6300	0.7000		0.7700		136.0605 (79)	
Solar gains	136.0605	231.7615	317.1061	392.9099	440.0918	436.9093	421.2272	386.0273	343.3589	256.1458	162.9692	116.4395 (83)
Total gains	535.4069	629.0545	701.6357	756.9188	783.3434	760.1309	731.4280	702.0158	669.8875	603.3990	534.0045	505.2355 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	73.6187	73.8286	74.0355	75.0232	75.2109	76.0972	76.0972	76.2637	75.7534	75.2109	74.8321	74.4402
alpha	5.9079	5.9219	5.9357	6.0015	6.0141	6.0731	6.0731	6.0842	6.0502	6.0141	5.9888	5.9627
util living area	0.9942	0.9845	0.9592	0.8886	0.7482	0.5543	0.4005	0.4347	0.6659	0.9137	0.9853	0.9958 (86)
MIT	20.1731	20.3483	20.5705	20.8040	20.9440	20.9923	20.9991	20.9985	20.9780	20.7979	20.4418	20.1403 (87)
Th 2	20.1309	20.1331	20.1353	20.1458	20.1477	20.1568	20.1568	20.1585	20.1533	20.1477	20.1438	20.1396 (88)
util rest of house	0.9924	0.9799	0.9475	0.8595	0.6952	0.4846	0.3242	0.3560	0.5939	0.8841	0.9802	0.9944 (89)
MIT 2	19.0350	19.2896	19.6062	19.9290	20.0971	20.1520	20.1565	20.1579	20.1377	19.9297	19.4347	18.9941 (90)
Living area fraction	19.4615	19.6864	19.9676	20.2569	20.4145	20.4669	20.4722	20.4729	20.4526	20.2550	19.8121	19.4236 (92)
Temperature adjustment	19.4615	19.6864	19.9676	20.2569	20.4145	20.4669	20.4722	20.4729	20.4526	20.2550	19.8121	19.4236 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9906	0.9770	0.9448	0.8637	0.7125	0.5105	0.3528	0.3856	0.6201	0.8883	0.9777	0.9930 (94)
Ext temp.	530.3520	614.5805	662.9033	653.7423	558.1012	388.0767	258.0828	270.6708	415.3845	536.0107	522.0740	501.6772 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Month fracti	1045.7481	1016.9753	923.6818	768.6651	588.3477	391.4831	258.3839	271.1818	425.8161	651.8481	862.5873	1038.4448 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating per m2	383.4547	270.4093	194.0193	82.7444	22.5034	0.0000	0.0000	0.0000	0.0000	86.1830	245.1696	399.3551 (98)
												1683.8387 (98)
												23.0284 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1800.8970 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	383.4547	270.4093	194.0193	82.7444	22.5034	0.0000	0.0000	0.0000	0.0000	86.1830	245.1696	399.3551	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	410.1119	289.2078	207.5072	88.4966	24.0678	0.0000	0.0000	0.0000	0.0000	92.1744	262.2135	427.1177	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	192.2450	169.4722	178.0463	159.6944	156.5588	139.9823	134.5249	147.4958	147.1978	165.5896	174.9838	187.6492	(64)
Efficiency of water heater (217)m	86.6215	86.0545	85.0432	83.1555	81.0036	79.8000	79.8000	79.8000	79.8000	83.1658	85.7135	86.7803	(216)
Fuel for water heating, kWh/month	221.9368	196.9358	209.3598	192.0430	193.2738	175.4164	168.5775	184.8318	184.4584	199.1077	204.1497	216.2348	(219)
Water heating fuel used												2346.3256	(219)
Annual totals kWh/year													
Space heating fuel - main system												1800.8970	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												333.6730	(232)
Total delivered energy for all uses												4555.8956	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1800.8970	0.2160	388.9937 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2346.3256	0.2160	506.8063 (264)
Space and water heating			895.8001 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	333.6730	0.5190	173.1763 (268)
Total CO2, kg/m2/year			1107.9014 (272)
Emissions per m2 for space and water heating			12.2511 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3684 (272b)
Emissions per m2 for pumps and fans			0.5323 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.2511 * 1.00) + 2.3684 + 0.5323, rounded to 2 d.p.			15.1500 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	016			Issued on Date	29/04/2022
Assessment Reference	016	Prop Type Ref			
Property					
SAP Rating	85 B	DER	13.55	TER	15.25
Environmental	90 B	% DER<TER	11.15		
CO ₂ Emissions (t/year)	0.84	DFEE	30.26	TFEE	34.99
General Requirements Compliance	Fail	% DFEE<TFEE	13.52		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 72 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 15.25 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.55 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)35.0 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)30.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing South West:	5.88 m ² , No overhang
Windows facing West:	3.92 m ² , No overhang
Windows facing North West:	2.55 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.0300 (1b)	x 2.5000 (2b)	= 180.0750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 180.0750 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							2	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1275 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross		Openings	NetArea	U-value	A x U	K-value	A x K				
	m2		m2	m2	W/m2K	W/K	kJ/m2K	kJ/K				
Door				1.8900	1.0000	1.8900			(26)			
Window (Uw = 1.20)				12.3500	1.1450	14.1412			(27)			
External Wall	39.7500		12.3500	27.4000	0.1500	4.1100			(29a)			
Corridor	10.1800		1.8900	8.2900	0.2500	2.0725			(29a)			
Total net area of external elements Aum(A, m2)				49.9300					(31)			
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =		22.2137			(33)			
Party Wall				37.2500	0.0000	0.0000			(32)			
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K									250.0000 (35)			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)									7.0350 (36)			
Total fabric heat loss							(33) + (36) =	29.2487 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	16.6426	16.4532	16.2638	15.3167	15.1273	14.1802	14.1802	13.9908	14.5591	15.1273	15.5061	15.8850 (38)
Heat transfer coeff	45.8914	45.7019	45.5125	44.5655	44.3760	43.4290	43.4290	43.2395	43.8078	44.3760	44.7549	45.1337 (39)
Average = Sum(39)m / 12 =												44.5181 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.6371	0.6345	0.6319	0.6187	0.6161	0.6029	0.6029	0.6003	0.6082	0.6161	0.6213	0.6266 (40)
HLP (average)												0.6180 (40)
Days in month												
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2944 (42)
Average daily hot water use (litres/day)												88.6916 (43)
Daily hot water use	Jan 97.5607	Feb 94.0131	Mar 90.4654	Apr 86.9177	May 83.3701	Jun 79.8224	Jul 79.8224	Aug 83.3701	Sep 86.9177	Oct 90.4654	Nov 94.0131	Dec 97.5607 (44)
Energy conte	144.6798	126.5378	130.5757	113.8391	109.2313	94.2583	87.3442	100.2287	101.4258	118.2020	129.0267	140.1146 (45)
Energy content (annual)												Total = Sum(45)m = 1395.4639 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.7020	18.9807	19.5864	17.0759	16.3847	14.1387	13.1016	15.0343	15.2139	17.7303	19.3540	21.0172 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (56)													
If cylinder contains dedicated solar storage													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (57)													
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month													
199.9566 176.4653 185.8525 167.3328 164.5081 147.7520 142.6210 155.5055 154.9194 173.4788 182.5204 195.3914 (62)													
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
199.9566 176.4653 185.8525 167.3328 164.5081 147.7520 142.6210 155.5055 154.9194 173.4788 182.5204 195.3914 (64)													
Total per year (kWh/year) = Sum(64)m =													2046.3037 (64)
Heat gains from water heating, kWh/month													
92.3275 82.0158 87.6379 80.6464 80.5408 74.1358 73.2634 77.5475 76.5190 83.5236 85.6963 90.8096 (65)													

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
(66)m 114.7191 114.7191 114.7191 114.7191 114.7191 114.7191 114.7191 114.7191 114.7191 114.7191 114.7191 114.7191 (66)													
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
18.1753 16.1432 13.1285 9.9391 7.4296 6.2724 6.7775 8.8097 11.8244 15.0137 17.5233 18.6805 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
201.9878 204.0838 198.8019 187.5575 173.3634 160.0230 151.1107 149.0147 154.2966 165.5410 179.7351 193.0756 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.4719 34.4719 34.4719 34.4719 34.4719 34.4719 34.4719 34.4719 34.4719 34.4719 34.4719 34.4719 (69)													
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													
-91.7753 -91.7753 -91.7753 -91.7753 -91.7753 -91.7753 -91.7753 -91.7753 -91.7753 -91.7753 -91.7753 -91.7753 (71)													
Water heating gains (Table 5)													
124.0961 122.0473 117.7928 112.0089 108.2538 102.9664 98.4723 104.2305 106.2764 112.2629 119.0227 122.0559 (72)													
Total internal gains													
401.6749 399.6900 387.1390 366.9213 346.4626 326.6775 313.7763 319.4707 329.8131 350.2334 373.6968 391.2276 (73)													

6. Solar gains

[Jan]												
					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
Southwest					5.8800	36.7938	0.4000	0.8000	0.7700		47.9773 (79)	
West					3.9200	19.6403	0.4000	0.8000	0.7700		17.0733 (80)	
Northwest					2.5500	11.2829	0.4000	0.8000	0.7700		6.3804 (81)	

Solar gains	71.4309	128.1094	190.2195	257.1940	305.1504	309.7707	295.8612	259.4911	213.5576	145.8237	86.7822	60.3093 (83)
Total gains	473.1058	527.7994	577.3585	624.1152	651.6129	636.4482	609.6375	578.9618	543.3707	496.0571	460.4790	451.5369 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	108.9984	109.4501	109.9056	112.2413	112.7204	115.1785	115.1785	115.6831	114.1825	112.7204	111.7662	110.8281
alpha	8.2666	8.2967	8.3270	8.4828	8.5147	8.6786	8.6786	8.7122	8.6122	8.5147	8.4511	8.3885
util living area												
	0.9928	0.9812	0.9423	0.8187	0.6285	0.4365	0.3134	0.3435	0.5547	0.8598	0.9783	0.9947 (86)
MIT	20.5733	20.6864	20.8332	20.9592	20.9955	20.9998	21.0000	21.0000	20.9988	20.9495	20.7524	20.5545 (87)
Th 2	20.3967	20.3991	20.4014	20.4132	20.4156	20.4274	20.4274	20.4297	20.4226	20.4156	20.4108	20.4061 (88)
util rest of house												
	0.9908	0.9763	0.9289	0.7892	0.5907	0.3976	0.2726	0.3010	0.5090	0.8282	0.9718	0.9932 (89)
MIT 2	19.8281	19.9922	20.1982	20.3698	20.4116	20.4273	20.4274	20.4297	20.4218	20.3632	20.0976	19.8088 (90)
Living area fraction									fLA = Living area / (4) =			0.3762 (91)
MIT	20.1085	20.2534	20.4371	20.5915	20.6313	20.6427	20.6428	20.6443	20.6388	20.5838	20.3439	20.0894 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1085	20.2534	20.4371	20.5915	20.6313	20.6427	20.6428	20.6443	20.6388	20.5838	20.3439	20.0894 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9896	0.9749	0.9298	0.7985	0.6047	0.4122	0.2880	0.3170	0.5262	0.8378	0.9709	0.9923 (94)	
Useful gains	468.2089	514.5424	536.8164	498.3270	394.0627	262.3565	175.5722	183.5148	285.9053	415.5897	447.0816	448.0405 (95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W													
725.4724 701.6785 634.3121 521.0380 396.3346 262.4271 175.5747 183.5204 286.4524 443.0413 592.7307 717.1464 (97)													
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)	
Space heating kWh													
191.4041 125.7555 72.5368 16.3519 1.6902 0.0000 0.0000 0.0000 0.0000 20.4240 104.8673 200.2148 (98)													
Space heating													733.2447 (98)
Space heating per m2													10.1797 (99)
(98) / (4) =													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	733.2447	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	769.9069	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	2046.3037	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2148.6189	(310a)
Electricity used for heat distribution	29.1853	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	173.0071	(330a)
Total electricity for the above, kWh/year	173.0071	(331)
Electricity for lighting (calculated in Appendix L)	320.9819	(332)
Total delivered energy for all uses	3412.5147	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3260.9227	0.2160	704.3593 (367)
Electrical energy for heat distribution	29.1853	0.5190	15.1471 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			719.5064 (373)
Space and water heating			719.5064 (376)
Pumps and fans	173.0071	0.5190	89.7907 (378)
Energy for lighting	320.9819	0.5190	166.5896 (379)
Total CO2, kg/year			975.8867 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			13.5500 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		13.5500	ZC1
Total Floor Area	TFA	72.0300	
Assumed number of occupants	N	2.2944	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.6172	ZC2
CO2 emissions from cooking, equation (L16)		2.4166	ZC3
Total CO2 emissions		32.5838	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		32.5838	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.0300 (1b)	x 2.5000 (2b)	= 180.0750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 180.0750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1666 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4166 (18)
Number of sides sheltered					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3541 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4515	0.4426	0.4338	0.3895	0.3807	0.3364	0.3364	0.3275	0.3541	0.3807	0.3984	0.4161 (22b)
Effective ac	0.6019	0.5980	0.5941	0.5759	0.5725	0.5566	0.5566	0.5536	0.5627	0.5725	0.5793	0.5866 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			12.3500	1.3258	16.3731			(27)					
External Wall	39.7500	12.3500	27.4000	0.1800	4.9320			(29a)					
Corridor	10.1800	1.8900	8.2900	0.1800	1.4922			(29a)					
Total net area of external elements Aum(A, m2)			49.9300					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.6873			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								5.2448 (36)					
Total fabric heat loss						(33) + (36) =	29.9321	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 35.7690	Feb 35.5338	Mar 35.3033	Apr 34.2205	May 34.0179	Jun 33.0748	Jul 33.0748	Aug 32.9002	Sep 33.4381	Oct 34.0179	Nov 34.4277	Dec 34.8562	(38)
Heat transfer coeff	65.7011	65.4659	65.2354	64.1526	63.9500	63.0069	63.0069	62.8323	63.3702	63.9500	64.3598	64.7883	(39)
Average = Sum(39)m / 12 =												64.1516	(39)
HLP	Jan 0.9121	Feb 0.9089	Mar 0.9057	Apr 0.8906	May 0.8878	Jun 0.8747	Jul 0.8747	Aug 0.8723	Sep 0.8798	Oct 0.8878	Nov 0.8935	Dec 0.8995	(40)
HLP (average)												0.8906	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2944 (42)
Average daily hot water use (litres/day)												88.6916 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	97.5607	94.0131	90.4654	86.9177	83.3701	79.8224	79.8224	83.3701	86.9177	90.4654	94.0131	97.5607 (44)
Energy conte	144.6798	126.5378	130.5757	113.8391	109.2313	94.2583	87.3442	100.2287	101.4258	118.2020	129.0267	140.1146 (45)
Energy content (annual)										Total = Sum(45)m =		1395.4639 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.7020	18.9807	19.5864	17.0759	16.3847	14.1387	13.1016	15.0343	15.2139	17.7303	19.3540	21.0172 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	191.2747	168.6236	177.1706	158.9309	155.8262	139.3501	133.9391	146.8236	146.5176	164.7969	174.1185	186.7095 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	191.2747	168.6236	177.1706	158.9309	155.8262	139.3501	133.9391	146.8236	146.5176	164.7969	174.1185	186.7095 (64)
	85.3819	75.7424	80.6923	73.9250	73.5953	67.4144	66.3179	70.6020	69.7975	76.5781	78.9748	83.8640 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5438	16.4704	13.3947	10.1406	7.5802	6.3996	6.9149	8.9883	12.0641	15.3181	17.8785	19.0592	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9878	204.0838	198.8019	187.5575	173.3634	160.0230	151.1107	149.0147	154.2966	165.5410	179.7351	193.0756	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	(71)
Water heating gains (Table 5)	114.7607	112.7119	108.4575	102.6736	98.9185	93.6311	89.1369	94.8951	96.9410	102.9275	109.6873	112.7205	(72)
Total internal gains	395.7080	393.6819	381.0698	360.7874	340.2778	320.4693	307.5783	313.3139	323.7174	344.2024	367.7166	385.2710	(73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Southwest			5.8800		36.7938		0.6300		0.7000		0.7700		66.1187 (79)
West			3.9200		19.6403		0.6300		0.7000		0.7700		23.5291 (80)
Northwest			2.5500		11.2829		0.6300		0.7000		0.7700		8.7929 (81)
Solar gains	98.4407	176.5508	262.1463	354.4454	420.5353	426.9027	407.7337	357.6112	294.3091	200.9633	119.5968		83.1138 (83)
Total gains	494.1487	570.2327	643.2161	715.2328	760.8132	747.3720	715.3120	670.9251	618.0265	545.1657	487.3134		468.3847 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.1340	76.4075	76.6775	77.9717	78.2187	79.3894	79.3894	79.6101	78.9343	78.2187	77.7206	77.2066	
alpha	6.0756	6.0938	6.1118	6.1981	6.2146	6.2926	6.2926	6.3073	6.2623	6.2146	6.1814	6.1471	
util living area	0.9957	0.9890	0.9676	0.8937	0.7373	0.5344	0.3870	0.4296	0.6817	0.9312	0.9892	0.9968	(86)
MIT	20.1752	20.3317	20.5585	20.8125	20.9537	20.9947	20.9994	20.9989	20.9781	20.7845	20.4357	20.1508	(87)
Th 2	20.1572	20.1600	20.1627	20.1755	20.1779	20.1890	20.1890	20.1911	20.1847	20.1779	20.1730	20.1680	(88)
util rest of house	0.9943	0.9856	0.9580	0.8659	0.6853	0.4690	0.3160	0.3547	0.6113	0.9062	0.9853	0.9958	(89)
MIT 2	19.0583	19.2872	19.6128	19.9669	20.1362	20.1857	20.1888	20.1907	20.1690	19.9403	19.4494	19.0312	(90)
Living area fraction	19.4785	19.6802	19.9686	20.2851	20.4438	20.4901	20.4938	20.4947	20.4734	20.2579	19.8205	19.4524	(91)
MIT	19.4785	19.6802	19.9686	20.2851	20.4438	20.4901	20.4938	20.4947	20.4734	20.2579	19.8205	19.4524	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4785	19.6802	19.9686	20.2851	20.4438	20.4901	20.4938	20.4947	20.4734	20.2579	19.8205	19.4524	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	490.6249	560.6724	614.4704	622.2038	534.6411	368.8203	245.1432	256.9055	393.6713	495.5482	479.1311	465.8693	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	997.2450	967.5969	878.6310	730.3805	559.1638	371.1163	245.3351	257.2815	403.8865	617.6215	818.6890	988.1775	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	376.9254	273.4533	196.5355	77.8872	18.2449	0.0000	0.0000	0.0000	0.0000	90.8225	244.4817	388.5973	(98)
Space heating												1666.9477	(98)
Space heating per m2												23.1424	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1782.8318 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	376.9254	273.4533	196.5355	77.8872	18.2449	0.0000	0.0000	0.0000	0.0000	90.8225	244.4817	388.5973	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	403.1287	292.4634	210.1984	83.3018	19.5133	0.0000	0.0000	0.0000	0.0000	97.1364	261.4777	415.6120	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	191.2747	168.6236	177.1706	158.9309	155.8262	139.3501	133.9391	146.8236	146.5176	164.7969	174.1185	186.7095	(64)
Efficiency of water heater (217)m	86.5915	86.0966	85.0909	83.0286	80.8013	79.8000	79.8000	79.8000	79.8000	83.2993	85.7192	79.8000	(216)
Fuel for water heating, kWh/month	220.8932	195.8539	208.2134	191.4171	192.8511	174.6242	167.8435	183.9895	183.6060	197.8371	203.1267	215.2866	(219)
Water heating fuel used												2335.5422	(219)
Annual totals kWh/year													
Space heating fuel - main system												1782.8318	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												327.4893	(232)
Total delivered energy for all uses												4520.8633	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1782.8318	0.2160	385.0917 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2335.5422	0.2160	504.4771 (264)
Space and water heating			889.5688 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	327.4893	0.5190	169.9670 (268)
Total CO2, kg/m2/year			1098.4607 (272)
Emissions per m2 for space and water heating			12.3500 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3597 (272b)
Emissions per m2 for pumps and fans			0.5404 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.3500 * 1.00) + 2.3597 + 0.5404, rounded to 2 d.p.			15.2500 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	031			Issued on Date	29/04/2022
Assessment Reference	031	Prop Type Ref			
Property					
SAP Rating	84 B	DER	16.90	TER	18.28
Environmental	88 B	% DER<TER	7.57		
CO ₂ Emissions (t/year)	0.97	DFEE	43.08	TFEE	50.67
General Requirements Compliance	Fail	% DFEE<TFEE	14.98		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 70 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 18.28 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.90 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)50.7 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)43.1 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing North:	1.37 m ² , No overhang
Windows facing North East:	9.00 m ² , No overhang
Windows facing North West:	6.24 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	69.9600 (1b)	x 2.5000 (2b)	= 174.9000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.9000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					0.0000 / (5) = 0.0000 (8)
Measured/design AP50					Yes
Infiltration rate					3.0000
Number of sides sheltered					0.1500 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			16.6100	1.1450	19.0191		(27)
External Wall	37.2300	16.6100	20.6200	0.1500	3.0930		(29a)
Corridor	5.6000	1.8900	3.7100	0.2500	0.9275		(29a)
Main Roof	69.9600		69.9600	0.1000	6.9960		(30)
Total net area of external elements Aum(A, m ²)			112.7900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.9256		(33)
Party Wall			39.7800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.5958 (36)
Total fabric heat loss						(33) + (36) =	42.5214 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	16.1644	15.9804	15.7964	14.8766	14.6926	13.7727	13.7727	13.5887	14.1407	14.6926	15.0605	15.4285 (38)
Heat transfer coeff	58.6858	58.5018	58.3178	57.3979	57.2140	56.2941	56.2941	56.1101	56.6620	57.2140	57.5819	57.9499 (39)
Average = Sum(39)m / 12 =												57.3519 (39)
HLP	0.8388	0.8362	0.8336	0.8204	0.8178	0.8047	0.8047	0.8020	0.8099	0.8178	0.8231	0.8283 (40)
HLP (average)												0.8198 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2452 (42)
Average daily hot water use (litres/day)												87.5224 (43)
Daily hot water use	96.2746	92.7737	89.2728	85.7719	82.2710	78.7702	78.7702	82.2710	85.7719	89.2728	92.7737	96.2746 (44)
Energy conte	142.7725	124.8697	128.8544	112.3384	107.7913	93.0157	86.1928	98.9074	100.0887	116.6437	127.3258	138.2675 (45)
Energy content (annual)										Total = Sum(45)m =		1377.0680 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4159	18.7305	19.3282	16.8508	16.1687	13.9524	12.9289	14.8361	15.0133	17.4966	19.0989	20.7401 (46)

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	198.0493	174.7972	184.1312	165.8321	163.0681	146.5094	141.4696	154.1842	153.5824	171.9205	180.8194	193.5443	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
	Solar input (sum of months) = Sum (63)m =											0.0000 (63)	
Output from w/h	198.0493	174.7972	184.1312	165.8321	163.0681	146.5094	141.4696	154.1842	153.5824	171.9205	180.8194	193.5443	(64)
	Total per year (kWh/year) = Sum (64)m =											2027.9078 (64)	
Heat gains from water heating, kWh/month	91.6933	81.4611	87.0655	80.1475	80.0621	73.7227	72.8805	77.1082	76.0744	83.0055	85.1308	90.1954	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.5809	15.6152	12.6991	9.6140	7.1866	6.0672	6.5559	8.5216	11.4376	14.5227	16.9501	18.0695 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.2037	199.2500	194.0933	183.1152	169.2573	156.2328	147.5316	145.4853	150.6420	161.6202	175.4781	188.5025 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061 (71)
Water heating gains (Table 5)	123.2437	121.2219	117.0236	111.3159	107.6103	102.3926	97.9577	103.6400	105.6589	111.5665	118.2372	121.2304 (72)
Total internal gains	394.7055	392.7644	380.4932	360.7224	340.7315	321.3699	308.7225	314.3242	324.4159	344.3867	367.3426	384.4797 (73)

[Jan	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	1.3700	10.6334	0.4000	0.8000	0.7700	3.2305 (74)
Northeast	9.0000	11.2829	0.4000	0.8000	0.7700	22.5189 (75)
Northwest	6.2400	11.2829	0.4000	0.8000	0.7700	15.6131 (81)

7. Mean internal temperature (heating season)												

Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	82.7856	83.0459	83.3079	84.6430	84.9152	86.3027	86.3027	86.5857	85.7423	84.9152	84.3726	83.8368
alpha	6.5190	6.5364	6.5539	6.6429	6.6610	6.7535	6.7535	6.7724	6.7162	6.6610	6.6248	6.5891
util living area	0.9972	0.9942	0.9819	0.9197	0.7499	0.5303	0.3871	0.4457	0.7351	0.9585	0.9934	0.9978 (86)
MIT	20.2241	20.3336	20.5379	20.8058	20.9599	20.9965	20.9996	20.9991	20.9743	20.7614	20.4521	20.2069 (87)
Th 2	20.2198	20.2221	20.2243	20.2357	20.2379	20.2493	20.2493	20.2516	20.2447	20.2379	20.2334	20.2288 (88)
util rest of house	0.9963	0.9924	0.9761	0.8971	0.7008	0.4697	0.3212	0.3737	0.6680	0.9418	0.9909	0.9971 (89)
MIT 2	19.1780	19.3390	19.6355	20.0142	20.2014	20.2471	20.2492	20.2512	20.2254	19.9641	19.5210	19.1600 (90)
Living area fraction	19.5563	19.6987	19.9618	20.3005	20.4757	20.5181	20.5206	20.5217	20.4962	20.2524	19.8577	19.5386 (91)
MIT	19.5563	19.6987	19.9618	20.3005	20.4757	20.5181	20.5206	20.5217	20.4962	20.2524	19.8577	19.5386 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5563	19.6987	19.9618	20.3005	20.4757	20.5181	20.5206	20.5217	20.4962	20.2524	19.8577	19.5386 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9953	0.9908	0.9737	0.8993	0.7167	0.4916	0.3451	0.3998	0.6912	0.9421	0.9894	0.9963 (94)
Useful gains	434.0035	472.1819	516.8759	546.0734	481.7111	331.7132	220.5945	230.9866	350.7501	420.7462	414.8620	416.7652 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	895.3286	865.7498	785.0629	654.3634	502.0936	333.1545	220.7044	231.2681	362.4242	552.2542	734.6141	888.8709 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	343.2259	264.4777	199.5311	77.9688	15.1646	0.0000	0.0000	0.0000	0.0000	97.8420	230.2215	351.2467 (98)
Space heating												1579.6782 (98)
Space heating per m2												22.5797 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	1579.6782	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1658.6621	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating:		
Annual water heating requirement	2027.9078	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2129.3032	(310a)
Electricity used for heat distribution	37.8797	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	168.0352	(330a)
Total electricity for the above, kWh/year	168.0352	(331)
Electricity for lighting (calculated in Appendix L)	310.4834	(332)
Total delivered energy for all uses	4266.4838	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	4232.3634	0.2160	914.1905 (367)
Electrical energy for heat distribution	37.8797	0.5190	19.6595 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			933.8500 (373)
Space and water heating			933.8500 (376)
Pumps and fans	168.0352	0.5190	87.2103 (378)
Energy for lighting	310.4834	0.5190	161.1409 (379)
Total CO2, kg/year			1182.2012 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			16.9000 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		16.9000	ZC1
Total Floor Area	TFA	69.9600	
Assumed number of occupants	N	2.2452	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.7037	ZC2
CO2 emissions from cooking, equation (L16)		2.4712	ZC3
Total CO2 emissions		36.0748	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		36.0748	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	69.9600 (1b)	x 2.5000 (2b)	= 174.9000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.9000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					20.0000 / (5) = 0.1144 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3644 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3097 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.3949	0.3871	0.3794	0.3407	0.3329	0.2942	0.2942	0.2865	0.3097	0.3329	0.3484	0.3639 (22b)
Effective ac	0.5780	0.5749	0.5720	0.5580	0.5554	0.5433	0.5433	0.5410	0.5480	0.5554	0.5607	0.5662 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			15.6100	1.3258	20.6951		(27)
External Wall	37.2300	15.6100	21.6200	0.1800	3.8916		(29a)
Corridor	5.6000	1.8900	3.7100	0.1800	0.6678		(29a)
Main Roof	69.9600		69.9600	0.1300	9.0948		(30)
Total net area of external elements Aum(A, m ²)			112.7900				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	36.2393	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.3837 (36)
Total fabric heat loss						(33) + (36) =	43.6230 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	33.3581	33.1834	33.0121	32.2077	32.0572	31.3565	31.3565	31.2268	31.6264	32.0572	32.3616	32.6799 (38)
Heat transfer coeff	76.9811	76.8063	76.6351	75.8306	75.6801	74.9795	74.9795	74.8498	75.2494	75.6801	75.9846	76.3029 (39)
Average = Sum(39)m / 12 =												75.8299 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1004	1.0979	1.0954	1.0839	1.0818	1.0717	1.0717	1.0699	1.0756	1.0818	1.0861	1.0907 (40)
HLP (average)												1.0839 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2452 (42)
Average daily hot water use (litres/day)												87.5224 (43)
Daily hot water use	96.2746	92.7737	89.2728	85.7719	82.2710	78.7702	78.7702	82.2710	85.7719	89.2728	92.7737	96.2746 (44)
Energy conte	142.7725	124.8697	128.8544	112.3384	107.7913	93.0157	86.1928	98.9074	100.0887	116.6437	127.3258	138.2675 (45)
Energy content (annual)												Total = Sum(45)m = 1377.0680 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4159	18.7305	19.3282	16.8508	16.1687	13.9524	12.9289	14.8361	15.0133	17.4966	19.0989	20.7401 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	189.3674	166.9555	175.4493	157.4302	154.3862	138.1076	132.7877	145.5023	145.1806	163.2386	172.4176	184.8624 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	189.3674	166.9555	175.4493	157.4302	154.3862	138.1076	132.7877	145.5023	145.1806	163.2386	172.4176	184.8624 (64)
Heat gains from water heating, kWh/month	84.7478	75.1878	80.1200	73.4260	73.1165	67.0012	65.9350	70.1626	69.3530	76.0600	78.4093	83.2499 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.5806	15.6149	12.6989	9.6139	7.1865	6.0671	6.5558	8.5214	11.4374	14.5225	16.9499	18.0692	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.2037	199.2500	194.0933	183.1152	169.2573	156.2328	147.5316	145.4853	150.6420	161.6202	175.4781	188.5025	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	(71)
Water heating gains (Table 5)	113.9083	111.8866	107.6882	101.9805	98.2749	93.0572	88.6223	94.3046	96.3236	102.2311	108.9018	111.8950	(72)
Total internal gains	388.3699	386.4288	374.1577	354.3869	334.3960	315.0345	302.3870	307.9886	318.0804	338.0511	361.0070	378.1440	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				1.2900	10.6334	0.6300	0.7000	0.7700	4.1921 (74)			
Northeast				8.4600	11.2829	0.6300	0.7000	0.7700	29.1719 (75)			
Northwest				5.8600	11.2829	0.6300	0.7000	0.7700	20.2065 (81)			
Solar gains	53.5705	108.5225	194.7025	319.2669	429.2206	457.7249	428.1339	341.2003	237.0276	132.3691	67.3023	43.8197 (83)
Total gains	441.9404	494.9514	568.8601	673.6538	763.6166	772.7594	730.5209	649.1889	555.1079	470.4202	428.3094	421.9637 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	63.1108	63.2543	63.3957	64.0682	64.1956	64.7955	64.7955	64.9078	64.5631	64.1956	63.9384	63.6717	
alpha	5.2074	5.2170	5.2264	5.2712	5.2797	5.3197	5.3197	5.3272	5.3042	5.2797	5.2626	5.2448	
util living area	0.9975	0.9949	0.9850	0.9391	0.8046	0.6014	0.4480	0.5217	0.8120	0.9723	0.9948	0.9980	(86)
MIT	19.8556	19.9915	20.2531	20.6128	20.8785	20.9793	20.9964	20.9923	20.9068	20.5519	20.1442	19.8319	(87)
Th 2	20.0005	20.0026	20.0046	20.0140	20.0158	20.0240	20.0240	20.0255	20.0208	20.0158	20.0122	20.0085	(88)
util rest of house	0.9966	0.9932	0.9798	0.9183	0.7499	0.5179	0.3506	0.4157	0.7368	0.9590	0.9928	0.9974	(89)
MIT 2	18.4764	18.6758	19.0562	19.5679	19.9029	20.0111	20.0227	20.0225	19.9480	19.4953	18.9063	18.4474	(90)
Living area fraction	0.9966	0.9932	0.9798	0.9183	0.7499	0.5179	0.3506	0.4157	0.7368	0.9590	0.9928	0.9974	(91)
MIT	18.9751	19.1516	19.4890	19.9458	20.2557	20.3613	20.3748	20.3732	20.2947	19.8774	19.3540	18.9481	(92)
Temperature adjustment	18.9751	19.1516	19.4890	19.9458	20.2557	20.3613	20.3748	20.3732	20.2947	19.8774	19.3540	18.9481	(93)
adjusted MIT	18.9751	19.1516	19.4890	19.9458	20.2557	20.3613	20.3748	20.3732	20.2947	19.8774	19.3540	18.9481	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	439.9053	490.6056	555.3546	617.5049	583.6061	423.1178	281.9133	294.8570	421.8339	450.0326	424.3942	420.4226	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1129.7083	1094.6144	995.4139	837.6101	647.4953	431.9764	283.0339	297.3936	466.1498	702.1129	931.1127	1125.3208	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	513.2134	405.8939	327.4041	158.4757	47.5336	0.0000	0.0000	0.0000	0.0000	187.5477	364.8374	524.4443	(98)
Space heating												2529.3502	(98)
Space heating per m2												36.1542	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2705.1873 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	513.2134	405.8939	327.4041	158.4757	47.5336	0.0000	0.0000	0.0000	0.0000	187.5477	364.8374	524.4443	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	548.8914	434.1111	350.1649	169.4928	50.8380	0.0000	0.0000	0.0000	0.0000	200.5858	390.2004	560.9030	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	189.3674	166.9555	175.4493	157.4302	154.3862	138.1076	132.7877	145.5023	145.1806	163.2386	172.4176	184.8624	(64)
Efficiency of water heater (217)m	87.3434	87.0964	86.4553	84.8315	82.0846	79.8000	79.8000	79.8000	79.8000	85.1848	86.7664	87.4442	(216)
Fuel for water heating, kWh/month	216.8079	191.6905	202.9363	185.5799	188.0818	173.0671	166.4006	182.3338	181.9305	191.6289	198.7148	211.4062	(219)
Water heating fuel used												2290.5784	(219)
Annual totals kWh/year													
Space heating fuel - main system												2705.1873	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												310.4787	(232)
Total delivered energy for all uses												5381.2444	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2705.1873	0.2160	584.3205 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2290.5784	0.2160	494.7649 (264)
Space and water heating			1079.0854 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	310.4787	0.5190	161.1384 (268)
Total CO2, kg/m2/year			1279.1488 (272)
Emissions per m2 for space and water heating			15.4243 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3033 (272b)
Emissions per m2 for pumps and fans			0.5564 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.4243 * 1.00) + 2.3033 + 0.5564, rounded to 2 d.p.			18.2800 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	032				Issued on Date	29/04/2022
Assessment Reference	032			Prop Type Ref		
Property						
SAP Rating	84 B	DER	16.43	TER	17.94	
Environmental	88 B	% DER<TER	8.39			
CO ₂ Emissions (t/year)	1.00	DFEE	43.14	TFEE	49.48	
General Requirements Compliance	Pass	% DFEE<TFEE	12.82			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 75 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.94 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.43 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)49.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)43.1 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK
Based on:
Overshading: Average
Windows facing North East: 9.93 m², No overhang
Windows facing East: 2.21 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	74.6300 (1b)	x 2.5000 (2b)	= 186.5750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 186.5750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			12.1400	1.1450	13.9008		(27)
External Wall	31.9300	12.1400	19.7900	0.1500	2.9685		(29a)
Corridor	25.0000	1.8900	23.1100	0.2500	5.7775		(29a)
Main Roof	74.6300		74.6300	0.1000	7.4630		(30)
Total net area of external elements Aum(A, m ²)					131.5600		(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	31.9998	(33)
Party Wall			41.5000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.9526 (36)
Total fabric heat loss							(33) + (36) = 42.9524 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	16.3602	16.1813	16.0024	15.1077	14.9287	14.0341	14.0341	13.8551	14.3919	14.9287	15.2866	15.6445 (38)
Average = Sum(39)m / 12 =	59.3126	59.1337	58.9547	58.0600	57.8811	56.9864	56.9864	56.8075	57.3443	57.8811	58.2390	58.5969 (39)
	59.3126	59.1337	58.9547	58.0600	57.8811	56.9864	56.9864	56.8075	57.3443	57.8811	58.2390	58.0153 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7948	0.7924	0.7900	0.7780	0.7756	0.7636	0.7636	0.7612	0.7684	0.7756	0.7804	0.7852 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3531 (42)
Average daily hot water use (litres/day)												90.0860 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	99.0946	95.4911	91.8877	88.2843	84.6808	81.0774	81.0774	84.6808	88.2843	91.8877	95.4911	99.0946 (44)
Energy content (annual)	146.9544	128.5272	132.6286	115.6288	110.9486	95.7402	88.7174	101.8045	103.0204	120.0603	131.0552	142.3175 (45)
Distribution loss (46)m = 0.15 x (45)m	22.0432	19.2791	19.8943	17.3443	16.6423	14.3610	13.3076	15.2707	15.4531	18.0090	19.6583	21.3476 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1643.2857 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1725.4500 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2068.2430 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2171.6551 (310a)
Electricity used for heat distribution	38.9711 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	179.2519 (330a)
Total electricity for the above, kWh/year	179.2519 (331)
Electricity for lighting (calculated in Appendix L)	332.5970 (332)
Total delivered energy for all uses	4408.9540 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	4354.3073	0.2160	940.5304 (367)
Electrical energy for heat distribution	38.9711	0.5190	20.2260 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			960.7564 (373)
Space and water heating			960.7564 (376)
Pumps and fans	179.2519	0.5190	93.0318 (378)
Energy for lighting	332.5970	0.5190	172.6178 (379)
Total CO2, kg/year			1226.4060 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			16.4300 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		16.4300 ZC1
Total Floor Area	TFA	74.6300
Assumed number of occupants	N	2.3531
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.5040 ZC2
CO2 emissions from cooking, equation (L16)		2.3513 ZC3
Total CO2 emissions		35.2853 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		35.2853 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	74.6300 (1b)	x 2.5000 (2b)	= 186.5750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 186.5750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1608 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4108 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3184 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4059	0.3980	0.3900	0.3502	0.3422	0.3024	0.3024	0.2945	0.3184	0.3422	0.3582	0.3741 (22b)
Effective ac	0.5824	0.5792	0.5760	0.5613	0.5586	0.5457	0.5457	0.5434	0.5507	0.5586	0.5641	0.5700 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			12.1400	1.3258	16.0947		(27)
External Wall	31.9300	12.1400	19.7900	0.1800	3.5622		(29a)
Corridor	25.0000	1.8900	23.1100	0.1800	4.1598		(29a)
Main Roof	74.6300		74.6300	0.1300	9.7019		(30)
Total net area of external elements Aum(A, m ²)			131.5600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.4086		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.6755 (36)
Total fabric heat loss						(33) + (36) =	43.0841 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	35.8572	35.6602	35.4672	34.5604	34.3907	33.6009	33.6009	33.4546	33.9051	34.3907	34.7339	35.0928 (38)
Heat transfer coeff	78.9413	78.7443	78.5513	77.6445	77.4748	76.6850	76.6850	76.5387	76.9892	77.4748	77.8180	78.1768 (39)
Average = Sum(39)m / 12 =												77.6436 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0578	1.0551	1.0525	1.0404	1.0381	1.0275	1.0275	1.0256	1.0316	1.0381	1.0427	1.0475 (40)
HLP (average)												1.0404 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3531 (42)
Average daily hot water use (litres/day)												90.0860 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	99.0946	95.4911	91.8877	88.2843	84.6808	81.0774	81.0774	84.6808	88.2843	91.8877	95.4911	99.0946 (44)
Energy conte	146.9544	128.5272	132.6286	115.6288	110.9486	95.7402	88.7174	101.8045	103.0204	120.0603	131.0552	142.3175 (45)
Energy content (annual)												Total = Sum(45)m = 1417.4032 (45)
Distribution loss (46)m = 0.15 x (45)m	22.0432	19.2791	19.8943	17.3443	16.6423	14.3610	13.3076	15.2707	15.4531	18.0090	19.6583	21.3476 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	193.5493	170.6130	179.2235	160.7207	157.5435	140.8321	135.3123	148.3994	148.1122	166.6552	176.1471	188.9124 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	193.5493	170.6130	179.2235	160.7207	157.5435	140.8321	135.3123	148.3994	148.1122	166.6552	176.1471	188.9124 (64)
Heat gains from water heating, kWh/month	86.1383	76.4039	81.3749	74.5201	74.1663	67.9071	66.7745	71.1259	70.3277	77.1960	79.6493	84.5965 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.2699	17.1154	13.9192	10.5377	7.8770	6.6501	7.1857	9.3403	12.5365	15.9179	18.5786	19.8055 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	207.8536	210.0105	204.5753	193.0043	178.3980	164.6701	155.4991	153.3422	158.7774	170.3484	184.9547	198.6826 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238 (71)
Water heating gains (Table 5)	115.7772	113.6963	109.3749	103.5001	99.6859	94.3154	89.7506	95.5994	97.6774	103.7580	110.6241	113.7050 (72)
Total internal gains	404.1972	402.1185	389.1657	368.3384	347.2574	326.9321	313.7318	319.5782	330.2877	351.3208	375.4538	393.4894 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W		
Northeast				9.9300	11.2829	0.6300	0.7000	0.7700		34.2408 (75)		
East				2.2100	19.6403	0.6300	0.7000	0.7700		13.2651 (76)		
Solar gains	47.5059	95.6475	168.3087	268.5545	353.5944	373.7283	350.9101	284.3482	202.7161	115.9677	59.6238	38.8713 (83)
Total gains	451.7031	497.7660	557.4744	636.8930	700.8518	700.6604	664.6419	603.9264	533.0038	467.2885	435.0776	432.3607 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	65.6518	65.8160	65.9778	66.7483	66.8945	67.5835	67.5835	67.7126	67.3164	66.8945	66.5995	66.2938
alpha	5.3768	5.3877	5.3985	5.4499	5.4596	5.5056	5.5056	5.5142	5.4878	5.4596	5.4400	5.4196
util living area	0.9979	0.9960	0.9891	0.9579	0.8566	0.6677	0.5016	0.5702	0.8444	0.9779	0.9958	0.9984 (86)
MIT	19.8896	20.0114	20.2472	20.5770	20.8457	20.9704	20.9948	20.9901	20.8957	20.5520	20.1677	19.8693 (87)
Th 2	20.0355	20.0376	20.0398	20.0498	20.0517	20.0605	20.0605	20.0621	20.0571	20.0517	20.0479	20.0439 (88)
util rest of house	0.9972	0.9947	0.9852	0.9424	0.8095	0.5830	0.3977	0.4605	0.7760	0.9670	0.9941	0.9978 (89)
MIT 2	18.5513	18.7306	19.0746	19.5505	19.9018	20.0411	20.0585	20.0579	19.9722	19.5242	18.9668	18.5278 (90)
Living area fraction									fLA = Living area / (4) =			0.3631 (91)
MIT	19.0373	19.1957	19.5004	19.9232	20.2445	20.3786	20.3985	20.3964	20.3075	19.8974	19.4029	19.0150 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0373	19.1957	19.5004	19.9232	20.2445	20.3786	20.3985	20.3964	20.3075	19.8974	19.4029	19.0150 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9962	0.9931	0.9823	0.9400	0.8201	0.6128	0.4356	0.5005	0.7962	0.9648	0.9925	0.9970 (94)
Useful gains	449.9918	494.3266	547.6274	598.6574	574.7676	429.3573	289.5377	302.2912	424.4038	450.8242	431.8055	431.0592 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1163.3779	1125.7070	1021.2002	855.8935	661.9856	443.1293	291.2894	305.8803	477.9138	720.3123	957.3871	1158.1867 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	530.7592	424.2876	352.3382	185.2100	64.8902	0.0000	0.0000	0.0000	0.0000	200.4992	378.4187	540.9828 (98)
Space heating												2677.3860 (98)
Space heating per m2										(98) / (4) =		35.8755 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2863.5144 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	530.7592	424.2876	352.3382	185.2100	64.8902	0.0000	0.0000	0.0000	0.0000	200.4992	378.4187	540.9828	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	567.6569	453.7835	376.8323	198.0856	69.4013	0.0000	0.0000	0.0000	0.0000	214.4376	404.7259	578.5913	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	193.5493	170.6130	179.2235	160.7207	157.5435	140.8321	135.3123	148.3994	148.1122	166.6552	176.1471	188.9124	(64)
Efficiency of water heater (217)m	87.3695	87.1487	86.5856	85.1928	82.6508	79.8000	79.8000	79.8000	79.8000	85.3079	86.8031	79.8000	(216)
Fuel for water heating, kWh/month	221.5295	195.7722	206.9900	188.6553	190.6135	176.4813	169.5643	185.9642	185.6043	195.3572	202.9272	215.9872	(219)
Water heating fuel used												2335.4461	(219)
Annual totals kWh/year													
Space heating fuel - main system												2863.5144	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												340.3127	(232)
Total delivered energy for all uses												5614.2732	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2863.5144	0.2160	618.5191 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2335.4461	0.2160	504.4564 (264)
Space and water heating			1122.9755 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	340.3127	0.5190	176.6223 (268)
Total CO2, kg/m2/year			1338.5228 (272)
Emissions per m2 for space and water heating			15.0472 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3666 (272b)
Emissions per m2 for pumps and fans			0.5216 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.0472 * 1.00) + 2.3666 + 0.5216, rounded to 2 d.p.			17.9400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	036			Issued on Date	29/04/2022
Assessment Reference	036	Prop Type Ref			
Property					
SAP Rating	84 B	DER	15.88	TER	16.97
Environmental	88 B	% DER<TER	6.43		
CO ₂ Emissions (t/year)	0.96	DFEE	40.19	TFEE	44.03
General Requirements Compliance	Pass	% DFEE<TFEE	8.72		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.97 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.88 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 44.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 40.2 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.23 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading: Average
Windows facing South West: 12.12 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.1200 (1b)	x 2.5000 (2b)	= 182.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 182.8000 (5)

2. Ventilation rate

					main	secondary	other			total	m3 per hour	
					heating		heating					
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Air changes per hour												
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =										0.0000 / (5) =	0.0000 (8)	
Pressure test												Yes
Measured/design AP50												3.0000
Infiltration rate												0.1500 (18)
Number of sides sheltered												3 (19)
Shelter factor										(20) = 1 - [0.075 x (19)] =	0.7750 (20)	
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =	0.1163 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			12.1200	1.1450	13.8779		(27)					
External Wall	25.1000	12.1200	12.9800	0.1500	1.9470		(29a)					
Corridor	25.1000	1.8900	23.2100	0.2500	5.8025		(29a)					
Core	18.2300		18.2300	0.2500	4.5575		(29a)					
Main Roof	73.1200		73.1200	0.1000	7.3120		(30)					
Total net area of external elements Aum(A, m2)			141.5500				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		35.3869		(33)					
Party Wall			18.2300	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.3272 (36)					
Total fabric heat loss						(33) + (36) =	44.7141 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	16.0292	15.8539	15.6786	14.8020	14.6267	13.7501	13.7501	13.5748	14.1007	14.6267	14.9773	15.3280 (38)
Heat transfer coeff	60.7433	60.5680	60.3926	59.5161	59.3407	58.4642	58.4642	58.2888	58.8148	59.3407	59.6914	60.0420 (39)
Average = Sum(39)m / 12 =												59.4722 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8307	0.8283	0.8259	0.8140	0.8116	0.7996	0.7996	0.7972	0.8044	0.8116	0.8163	0.8211 (40)
HLP (average)												0.8134 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3194 (42)
Average daily hot water use (litres/day)												89.2864 (43)
Daily hot water use	Jan 98.2150	Feb 94.6436	Mar 91.0721	Apr 87.5007	May 83.9292	Jun 80.3578	Jul 80.3578	Aug 83.9292	Sep 87.5007	Oct 91.0721	Nov 94.6436	Dec 98.2150 (44)
Energy conte	145.6501	127.3865	131.4514	114.6025	109.9639	94.8905	87.9300	100.9009	102.1060	118.9947	129.8920	141.0543 (45)
Energy content (annual)												Total = Sum(45)m = 1404.8227 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1422.5252 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1493.6515 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2055.6625 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2158.4456 (310a)
Electricity used for heat distribution	36.5210 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	175.6251 (330a)
Total electricity for the above, kWh/year	175.6251 (331)
Electricity for lighting (calculated in Appendix L)	326.3147 (332)
Total delivered energy for all uses	4154.0369 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	4080.5554	0.2160	881.4000 (367)
Electrical energy for heat distribution	36.5210	0.5190	18.9544 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			900.3543 (373)
Space and water heating			900.3543 (376)
Pumps and fans	175.6251	0.5190	91.1494 (378)
Energy for lighting	326.3147	0.5190	169.3573 (379)
Total CO2, kg/year			1160.8611 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.8800 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		15.8800 ZC1
Total Floor Area	TFA	73.1200
Assumed number of occupants	N	2.3194
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.5704 ZC2
CO2 emissions from cooking, equation (L16)		2.3888 ZC3
Total CO2 emissions		34.8391 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		34.8391 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.1200 (1b)	x 2.5000 (2b)	= 182.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 182.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1641 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4141 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3209 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4092	0.4012	0.3931	0.3530	0.3450	0.3049	0.3049	0.2969	0.3209	0.3450	0.3611	0.3771 (22b)
Effective ac	0.5837	0.5805	0.5773	0.5623	0.5595	0.5465	0.5465	0.5441	0.5515	0.5595	0.5652	0.5711 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900			(26)				
TER Opening Type (Uw = 1.40)			12.1200	1.3258	16.0682			(27)				
External Wall	25.1000	12.1200	12.9800	0.1800	2.3364			(29a)				
Corridor	25.1000	1.8900	23.2100	0.1800	4.1778			(29a)				
Core	18.2300		18.2300	0.1800	3.2814			(29a)				
Main Roof	73.1200		73.1200	0.1300	9.5056			(30)				
Total net area of external elements Aum(A, m2)			141.5500					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	37.2594			(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								7.1803 (36)				
Total fabric heat loss						(33) + (36) =		44.4397 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 35.2124	Feb 35.0163	Mar 34.8240	Apr 33.9211	May 33.7522	Jun 32.9658	Jul 32.9658	Aug 32.8202	Sep 33.2687	Oct 33.7522	Nov 34.0939	Dec 34.4512 (38)
Heat transfer coeff	79.6521	79.4559	79.2637	78.3608	78.1919	77.4055	77.4055	77.2599	77.7084	78.1919	78.5336	78.8909 (39)
Average = Sum(39)m / 12 =												78.3600 (39)
HLP	Jan 1.0893	Feb 1.0867	Mar 1.0840	Apr 1.0717	May 1.0694	Jun 1.0586	Jul 1.0586	Aug 1.0566	Sep 1.0628	Oct 1.0694	Nov 1.0740	Dec 1.0789 (40)
HLP (average)												1.0717 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3194 (42)
Average daily hot water use (litres/day)												89.2864 (43)
Daily hot water use	98.2150	94.6436	91.0721	87.5007	83.9292	80.3578	80.3578	83.9292	87.5007	91.0721	94.6436	98.2150 (44)
Energy conte	145.6501	127.3865	131.4514	114.6025	109.9639	94.8905	87.9300	100.9009	102.1060	118.9947	129.8920	141.0543 (45)
Energy content (annual)										Total = Sum(45)m =		1404.8227 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.8475	19.1080	19.7177	17.1904	16.4946	14.2336	13.1895	15.1351	15.3159	17.8492	19.4838	21.1581 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	192.2450	169.4722	178.0463	159.6944	156.5588	139.9823	134.5249	147.4958	147.1978	165.5896	174.9838	187.6492 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	192.2450	169.4722	178.0463	159.6944	156.5588	139.9823	134.5249	147.4958	147.1978	165.5896	174.9838	187.6492 (64)
Heat gains from water heating, kWh/month	85.7046	76.0246	80.9835	74.1788	73.8389	67.6245	66.5126	70.8255	70.0237	76.8417	79.2626	84.1765 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.8881	16.7762	13.6433	10.3289	7.7210	6.5184	7.0433	9.1552	12.2880	15.6025	18.2104	19.4130	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.4667	206.5884	201.2418	189.8593	175.4910	161.9869	152.9652	150.8435	156.1902	167.5726	181.9409	195.4451	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	(71)
Water heating gains (Table 5)	115.1943	113.1318	108.8488	103.0261	99.2458	93.9230	89.3987	95.1955	97.2552	103.2818	110.0869	113.1404	(72)
Total internal gains	399.3405	397.2879	384.5253	364.0057	343.2492	323.2196	310.1987	315.9856	326.5248	347.2483	371.0297	388.7900	(73)

6. Solar gains

[Jan]					Area	Solar flux		g	FF	Access		Gains	
					m2	Table 6a		Specific data	Specific data	factor		W	
						W/m2		or Table 6b	or Table 6c	Table 6d			
-----					-----	-----		-----	-----	-----			
Southwest					12.1200	36.7938		0.6300	0.7000	0.7700		136.2854 (79)	
-----					-----	-----		-----	-----	-----			
Solar gains	136.2854	232.1445	317.6303	393.5593	440.8192	437.6314	421.9234	386.6654	343.9264	256.5692	163.2386	116.6319	(83)
Total gains	535.6259	629.4324	702.1556	757.5650	784.0685	760.8511	732.1221	702.6510	670.4512	603.8175	534.2682	505.4219	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	63.7495	63.9068	64.0618	64.8000	64.9400	65.5997	65.5997	65.7234	65.3440	64.9400	64.6574	64.3646
alpha	5.2500	5.2605	5.2708	5.3200	5.3293	5.3733	5.3733	5.3816	5.3563	5.3293	5.3105	5.2910
util living area	0.9949	0.9877	0.9696	0.9196	0.8087	0.6269	0.4611	0.4993	0.7359	0.9379	0.9884	0.9962 (86)
MIT	19.9645	20.1456	20.3910	20.6723	20.8786	20.9759	20.9961	20.9941	20.9442	20.6782	20.2660	19.9306 (87)
Th 2	20.0096	20.0117	20.0139	20.0240	20.0259	20.0348	20.0348	20.0364	20.0314	20.0259	20.0221	20.0181 (88)
util rest of house	0.9933	0.9838	0.9600	0.8945	0.7547	0.5424	0.3621	0.3981	0.6557	0.9129	0.9840	0.9950 (89)
MIT 2	18.6414	18.9051	19.2578	19.6537	19.9128	20.0195	20.0334	20.0341	19.9906	19.6711	19.0891	18.5982 (90)
Living area fraction									fLA = Living area / (4) =			0.3747 (91)
MIT	19.1372	19.3699	19.6824	20.0354	20.2747	20.3779	20.3941	20.3938	20.3479	20.0485	19.5301	19.0975 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1372	19.3699	19.6824	20.0354	20.2747	20.3779	20.3941	20.3938	20.3479	20.0485	19.5301	19.0975 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9914	0.9805	0.9560	0.8948	0.7695	0.5734	0.3994	0.4362	0.6835	0.9135	0.9811	0.9934	(94)
Useful gains	530.9976	617.1764	671.2617	677.8686	603.3708	436.2613	292.3832	306.4863	458.2355	551.6146	524.1938	502.0908	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1181.8134	1149.7216	1044.8867	872.5770	670.4705	447.2425	293.6861	308.5618	485.5167	738.7957	976.1833	1175.2742	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	484.2069	357.8703	277.9770	140.1900	49.9222	0.0000	0.0000	0.0000	0.0000	139.2627	325.4324	500.8484	(98)
Space heating												2275.7101	(98)
Space heating per m2												31.1229	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2433.9145 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	484.2069	357.8703	277.9770	140.1900	49.9222	0.0000	0.0000	0.0000	0.0000	139.2627	325.4324	500.8484	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	517.8684	382.7490	297.3017	149.9359	53.3927	0.0000	0.0000	0.0000	0.0000	148.9441	348.0560	535.6667	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	192.2450	169.4722	178.0463	159.6944	156.5588	139.9823	134.5249	147.4958	147.1978	165.5896	174.9838	187.6492	(64)
Efficiency of water heater (217)m	87.1780	86.7614	85.9979	84.4687	82.1483	79.8000	79.8000	79.8000	79.8000	84.3561	86.4468	87.3093	(217)
Fuel for water heating, kWh/month	220.5202	195.3314	207.0357	189.0575	190.5807	175.4164	168.5775	184.8318	184.4584	196.2982	202.4179	214.9246	(219)
Water heating fuel used													2329.4504 (219)
Annual totals kWh/year													
Space heating fuel - main system													2433.9145 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													75.0000 (231)
Electricity for lighting (calculated in Appendix L)													333.5691 (232)
Total delivered energy for all uses													5171.9341 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2433.9145	0.2160	525.7255 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2329.4504	0.2160	503.1613 (264)
Space and water heating			1028.8868 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	333.5691	0.5190	173.1224 (268)
Total CO2, kg/m2/year			1240.9342 (272)
Emissions per m2 for space and water heating			14.0712 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3676 (272b)
Emissions per m2 for pumps and fans			0.5323 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.0712 * 1.00) + 2.3676 + 0.5323, rounded to 2 d.p.			16.9700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	037			Issued on Date	29/04/2022
Assessment Reference	037	Prop Type Ref			
Property					
SAP Rating	85 B	DER	15.25	TER	16.96
Environmental	89 B	% DER<TER	10.07		
CO ₂ Emissions (t/year)	0.92	DFEE	37.45	TFEE	43.80
General Requirements Compliance	Pass	% DFEE<TFEE	14.49		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aecom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 72 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 16.96 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.25 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)43.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)37.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing South West:	5.88 m ² , No overhang
Windows facing West:	3.92 m ² , No overhang
Windows facing North West:	2.55 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.0300 (1b)	x 2.5000 (2b)	= 180.0750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 180.0750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			12.3500	1.1450	14.1412		(27)
External Wall	39.7500	12.3500	27.4000	0.1500	4.1100		(29a)
Corridor	10.1800	1.8900	8.2900	0.2500	2.0725		(29a)
Main Roof	72.0300		72.0300	0.1000	7.2030		(30)
Total net area of external elements Aum(A, m ²)				121.9600			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.4167		(33)
Party Wall			37.2500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.6140 (36)
Total fabric heat loss							(33) + (36) = 38.0307 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	16.6426	16.4532	16.2638	15.3167	15.1273	14.1802	14.1802	13.9908	14.5591	15.1273	15.5061	15.8850 (38)
Heat transfer coeff	54.6734	54.4839	54.2945	53.3475	53.1580	52.2110	52.2110	52.0215	52.5898	53.1580	53.5369	53.9157 (39)
Average = Sum(39)m / 12 =												53.3001 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.7590	0.7564	0.7538	0.7406	0.7380	0.7249	0.7249	0.7222	0.7301	0.7380	0.7433	0.7485 (40)
HLP (average)												0.7400 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2944 (42)
Average daily hot water use (litres/day)												88.6916 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.5607	94.0131	90.4654	86.9177	83.3701	79.8224	79.8224	83.3701	86.9177	90.4654	94.0131	97.5607 (44)
Energy conte	144.6798	126.5378	130.5757	113.8391	109.2313	94.2583	87.3442	100.2287	101.4258	118.2020	129.0267	140.1146 (45)
Energy content (annual)												Total = Sum(45)m = 1395.4639 (45)
Distribution loss (46)m = 0.15 x (45)m	21.7020	18.9807	19.5864	17.0759	16.3847	14.1387	13.1016	15.0343	15.2139	17.7303	19.3540	21.0172 (46)

Water storage loss:												110.0000 (47)
Store volume												
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage												
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
	199.9566	176.4653	185.8525	167.3328	164.5081	147.7520	142.6210	155.5055	154.9194	173.4788	182.5204	195.9514 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
	199.9566	176.4653	185.8525	167.3328	164.5081	147.7520	142.6210	155.5055	154.9194	173.4788	182.5204	195.9514 (64)
Total per year (kWh/year) = Sum(64)m =												2046.3037 (64)
Heat gains from water heating, kWh/month												
	92.3275	82.0158	87.6379	80.6464	80.5408	74.1358	73.2634	77.5475	76.5190	83.5236	85.6963	90.8096 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.1753	16.1432	13.1285	9.9391	7.4296	6.2724	6.7775	8.8097	11.8244	15.0137	17.5233	18.6805 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9878	204.0838	198.8019	187.5575	173.3634	160.0230	151.1107	149.0147	154.2966	165.5410	179.7351	193.0756 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753 (71)
Water heating gains (Table 5)	124.0961	122.0473	117.7928	112.0089	108.2538	102.9664	98.4723	104.2305	106.2764	112.2629	119.0227	122.0559 (72)
Total internal gains	401.6749	399.6900	387.1390	366.9213	346.4626	326.6775	313.7763	319.4707	329.8131	350.2334	373.6968	391.2276 (73)

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Southwest				5.8800	36.7938	0.4000	0.8000	0.7700	47.9773 (79)			
West				3.9200	19.6403	0.4000	0.8000	0.7700	17.0733 (80)			
Northwest				2.5500	11.2829	0.4000	0.8000	0.7700	6.3084 (81)			
Solar gains	71.4309	128.1094	190.2195	257.1940	305.1504	309.7707	295.8612	259.4911	213.5576	145.8237	86.7822	60.3093 (83)
Total gains	473.1058	527.7994	577.3585	624.1152	651.6129	636.4482	609.6375	578.9618	543.3707	496.0571	460.4790	451.5369 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	91.4903	91.8084	92.1287	93.7642	94.0984	95.8052	95.8052	96.1541	95.1151	94.0984	93.4325	92.7760
alpha	7.0994	7.1206	7.1419	7.2509	7.2732	7.3870	7.3870	7.4103	7.3410	7.2732	7.2288	7.1851
util living area	0.9955	0.9891	0.9684	0.8931	0.7313	0.5229	0.3767	0.4130	0.6560	0.9211	0.9879	0.9966 (86)
MIT	20.3794	20.5012	20.6793	20.8758	20.9749	20.9981	20.9999	20.9997	20.9909	20.8648	20.5927	20.3589 (87)
Th 2	20.2890	20.2913	20.2936	20.3051	20.3074	20.3189	20.3189	20.3212	20.3143	20.3074	20.3028	20.2982 (88)
util rest of house	0.9941	0.9860	0.9594	0.8673	0.6853	0.4682	0.3185	0.3522	0.5956	0.8957	0.9838	0.9956 (89)
MIT 2	19.4586	19.6367	19.8922	20.1666	20.2847	20.3177	20.3189	20.3211	20.3078	20.1594	19.7793	19.4361 (90)
Living area fraction									fLA = Living area / (4) =			0.3762 (91)
MIT	19.8050	19.9620	20.1884	20.4334	20.5443	20.5737	20.5751	20.5764	20.5648	20.4248	20.0853	19.7833 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8050	19.9620	20.1884	20.4334	20.5443	20.5737	20.5751	20.5764	20.5648	20.4248	20.0853	19.7833 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9929	0.9842	0.9578	0.8724	0.7015	0.4888	0.3404	0.3751	0.6180	0.9005	0.9822	0.9946 (94)
Useful gains	469.7487	519.4377	553.0187	544.5056	457.0798	311.0704	207.4949	217.1693	335.8270	446.7044	452.2880	449.1109 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	847.7121	820.6352	743.2028	615.2790	470.1482	311.8916	207.5427	217.2645	339.9817	522.2664	695.1926	840.1841 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	281.2048	202.4047	141.4970	50.9568	9.7229	0.0000	0.0000	0.0000	0.0000	56.2181	174.8913	290.9585 (98)
Space heating												1207.8541 (98)
Space heating per m2												16.7688 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1207.8541 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1268.2468 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating:	
Annual water heating requirement	2046.3037 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2148.6189 (310a)
Electricity used for heat distribution	34.1687 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	173.0071 (330a)
Total electricity for the above, kWh/year	173.0071 (331)
Electricity for lighting (calculated in Appendix L)	320.9819 (332)
Total delivered energy for all uses	3910.8546 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3817.7270	0.2160	824.6290 (367)
Electrical energy for heat distribution	34.1687	0.5190	17.7335 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			842.3626 (373)
Space and water heating			842.3626 (376)
Pumps and fans	173.0071	0.5190	89.7907 (378)
Energy for lighting	320.9819	0.5190	166.5896 (379)
Total CO2, kg/year			1098.7428 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.2500 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		15.2500 ZC1
Total Floor Area	TFA	72.0300
Assumed number of occupants	N	2.2944
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.6172 ZC2
CO2 emissions from cooking, equation (L16)		2.4166 ZC3
Total CO2 emissions		34.2838 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		34.2838 ZC8

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.0300 (1b)	x 2.5000 (2b)	= 180.0750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 180.0750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1666 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4166 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3541 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4515	0.4426	0.4338	0.3895	0.3807	0.3364	0.3364	0.3275	0.3541	0.3807	0.3984	0.4161 (22b)
Effective ac	0.6019	0.5980	0.5941	0.5759	0.5725	0.5566	0.5566	0.5536	0.5627	0.5725	0.5793	0.5866 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			12.3500	1.3258	16.3731		(27)
External Wall	39.7500	12.3500	27.4000	0.1800	4.9320		(29a)
Corridor	10.1800	1.8900	8.2900	0.1800	1.4922		(29a)
Main Roof	72.0300		72.0300	0.1300	9.3639		(30)
Total net area of external elements Aum(A, m ²)			121.9600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	34.0512	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.6349 (36)
Total fabric heat loss						(33) + (36) =	39.6861 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	35.7690	35.5338	35.3033	34.2205	34.0179	33.0748	33.0748	32.9002	33.4381	34.0179	34.4277	34.8562 (38)
Heat transfer coeff	75.4551	75.2199	74.9894	73.9066	73.7040	72.7609	72.7609	72.5863	73.1242	73.7040	74.1138	74.5423 (39)
Average = Sum(39)m / 12 =												73.9056 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0476	1.0443	1.0411	1.0261	1.0232	1.0101	1.0101	1.0077	1.0152	1.0232	1.0289	1.0349 (40)
HLP (average)												1.0260 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2944 (42)
Average daily hot water use (litres/day)												88.6916 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.5607	94.0131	90.4654	86.9177	83.3701	79.8224	79.8224	83.3701	86.9177	90.4654	94.0131	97.5607 (44)
Energy conte	144.6798	126.5378	130.5757	113.8391	109.2313	94.2583	87.3442	100.2287	101.4258	118.2020	129.0267	140.1146 (45)
Energy content (annual)										Total = Sum(45)m =		1395.4639 (45)
Distribution loss (46)m = 0.15 x (45)m	21.7020	18.9807	19.5864	17.0759	16.3847	14.1387	13.1016	15.0343	15.2139	17.7303	19.3540	21.0172 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	191.2747	168.6236	177.1706	158.9309	155.8262	139.3501	133.9391	146.8236	146.5176	164.7969	174.1185	186.7095 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	191.2747	168.6236	177.1706	158.9309	155.8262	139.3501	133.9391	146.8236	146.5176	164.7969	174.1185	186.7095 (64)
Heat gains from water heating, kWh/month	85.3819	75.7424	80.6923	73.9250	73.5953	67.4144	66.3179	70.6020	69.7975	76.5781	78.9748	83.8640 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5438	16.4704	13.3947	10.1406	7.5802	6.3996	6.9149	8.9883	12.0641	15.3181	17.8785	19.0592	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9878	204.0838	198.8019	187.5575	173.3634	160.0230	151.1107	149.0147	154.2966	165.5410	179.7351	193.0756	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	(71)
Water heating gains (Table 5)	114.7607	112.7119	108.4575	102.6736	98.9185	93.6311	89.1369	94.8951	96.9410	102.9275	109.6873	112.7205	(72)
Total internal gains	395.7080	393.6819	381.0698	360.7874	340.2778	320.4693	307.5783	313.3139	323.7174	344.2024	367.7166	385.2710	(73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Southwest			5.8800		36.7938		0.6300		0.7000		0.7700		66.1187 (79)
West			3.9200		19.6403		0.6300		0.7000		0.7700		23.5291 (80)
Northwest			2.5500		11.2829		0.6300		0.7000		0.7700		8.7929 (81)
Solar gains	98.4407	176.5508	262.1463	354.4454	420.5353	426.9027	407.7337	357.6112	294.3091	200.9633	119.5968	83.1138	(83)
Total gains	494.1487	570.2327	643.2161	715.2328	760.8132	747.3720	715.3120	670.9251	618.0265	545.1657	487.3134	468.3847	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	66.2922	66.4995	66.7039	67.6812	67.8672	68.7468	68.7468	68.9122	68.4053	67.8672	67.4919	67.1040	
alpha	5.4195	5.4333	5.4469	5.5121	5.5245	5.5831	5.5831	5.5941	5.5604	5.5245	5.4995	5.4736	
util living area	0.9962	0.9911	0.9758	0.9238	0.7993	0.6056	0.4448	0.4926	0.7505	0.9507	0.9913	0.9971	(86)
MIT	19.9798	20.1413	20.3885	20.6884	20.8968	20.9825	20.9973	20.9954	20.9455	20.6687	20.2706	19.9542	(87)
Th 2	20.0439	20.0466	20.0492	20.0617	20.0640	20.0749	20.0749	20.0769	20.0707	20.0640	20.0593	20.0544	(88)
util rest of house	0.9949	0.9882	0.9679	0.8999	0.7459	0.5255	0.3528	0.3964	0.6730	0.9300	0.9881	0.9962	(89)
MIT 2	18.6889	18.9254	19.2826	19.7075	19.9682	20.0638	20.0739	20.0751	20.0302	19.6916	19.1240	18.6593	(90)
Living area fraction	19.1746	19.3829	19.6987	20.0766	20.3176	20.4095	20.4213	20.4213	20.3746	20.0592	19.5554	19.1465	(92)
Temperature adjustment	19.1746	19.3829	19.6987	20.0766	20.3176	20.4095	20.4213	20.4213	20.3746	20.0592	19.5554	19.1465	(93)
adjusted MIT	19.1746	19.3829	19.6987	20.0766	20.3176	20.4095	20.4213	20.4213	20.3746	20.0592	19.5554	19.1465	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	490.8885	562.0390	620.2586	643.9593	579.2351	414.8963	277.1730	290.3205	432.5421	506.9373	480.3485	466.0112	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1122.3629	1089.4009	989.7603	826.0221	635.1517	422.7022	278.0440	291.8946	458.8237	697.1806	923.1159	1114.1434	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	469.8170	354.3872	274.9093	131.0852	41.6019	0.0000	0.0000	0.0000	0.0000	141.5410	318.7925	482.2104	(98)
Space heating												2214.3445	(98)
Space heating per m2												30.7420	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2368.2828 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	469.8170	354.3872	274.9093	131.0852	41.6019	0.0000	0.0000	0.0000	0.0000	141.5410	318.7925	482.2104	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	502.4781	379.0237	294.0206	140.1981	44.4940	0.0000	0.0000	0.0000	0.0000	151.3807	340.9546	515.7330	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	191.2747	168.6236	177.1706	158.9309	155.8262	139.3501	133.9391	146.8236	146.5176	164.7969	174.1185	186.7095	(64)
Efficiency of water heater (217)m	87.1202	86.7498	85.9818	84.3053	81.8389	79.8000	79.8000	79.8000	79.8000	84.4112	86.4073	87.2351	(216)
Fuel for water heating, kWh/month	219.5527	194.3792	206.0559	188.5183	190.4060	174.6242	167.8435	183.9895	183.6060	195.2310	201.5090	214.0302	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													2368.2828 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													75.0000 (231)
Electricity for lighting (calculated in Appendix L)													327.4893 (232)
Total delivered energy for all uses													5090.5177 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2368.2828	0.2160	511.5491 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2319.7455	0.2160	501.0650 (264)
Space and water heating			1012.6141 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	327.4893	0.5190	169.9670 (268)
Total CO2, kg/m2/year			1221.5061 (272)
Emissions per m2 for space and water heating			14.0582 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3597 (272b)
Emissions per m2 for pumps and fans			0.5404 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.0582 * 1.00) + 2.3597 + 0.5404, rounded to 2 d.p.			16.9600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	038			Issued on Date	29/04/2022
Assessment Reference	038	Prop Type Ref			
Property					
SAP Rating	83 B	DER	17.87	TER	19.45
Environmental	89 B	% DER<TER	8.15		
CO ₂ Emissions (t/year)	0.77	DFEE	41.49	TFEE	47.64
General Requirements Compliance	Fail	% DFEE<TFEE	12.89		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 19.45 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 17.87 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)47.6 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)41.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing North East:	6.24 m ² , No overhang
Windows facing East:	2.21 m ² , No overhang
Windows facing North West:	1.97 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			10.4200	1.1450	11.9313		(27)
External Wall	40.6000	10.4200	30.1800	0.1500	4.5270		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Total net area of external elements Aum(A, m ²)			58.1000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.2508		(33)
Party Wall			16.2500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.3600 (36)
Total fabric heat loss						(33) + (36) =	29.6108 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	11.7351	11.6015	11.4680	10.8002	10.6666	9.9988	9.9988	9.8652	10.2659	10.6666	10.9337	11.2009 (38)
Heat transfer coeff	41.3459	41.2123	41.0788	40.4110	40.2774	39.6096	39.6096	39.4760	39.8767	40.2774	40.5445	40.8117 (39)
Average = Sum(39)m / 12 =												40.3776 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8141	0.8114	0.8088	0.7956	0.7930	0.7799	0.7799	0.7772	0.7851	0.7930	0.7983	0.8035 (40)
HLP (average)												0.7950 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	30.9817	(56)
If cylinder contains dedicated solar storage													
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	30.9817	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	(59)
Total heat required for water heating calculated for each month													
177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	173.5921	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	173.5921	(64)
Heat gains from water heating, kWh/month													
84.8430	75.4698	80.8830	74.7574	74.8902	69.2597	68.7450	72.3625	71.2721	77.4089	79.0216	83.5613	83.5613	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
13.3089	11.8209	9.6134	7.2779	5.4403	4.5930	4.9629	6.4509	8.6584	10.9938	12.8314	13.6788	13.6788	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)													
114.0363	112.3063	108.7138	103.8297	100.6589	96.1941	92.3992	97.2615	98.9891	104.0442	109.7522	112.3135	112.3135	(72)
Total internal gains													
325.3314	323.6625	313.9587	298.4287	282.9297	267.7578	257.7459	262.5472	270.3860	286.0871	304.1233	317.3917	317.3917	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Northeast				6.2400	11.2829	0.4000	0.8000	0.7700	15.6131 (75)			
East				2.2100	19.6403	0.4000	0.8000	0.7700	9.6255 (76)			
Northwest				1.9700	11.2829	0.4000	0.8000	0.7700	4.9291 (81)			
Solar gains	30.1678	60.6439	106.3458	168.9493	221.7346	234.0410	219.8802	178.6279	127.8638	73.4433	37.8494	24.6914 (83)
Total gains	355.4992	384.3064	420.3045	467.3780	504.6643	501.7988	477.6261	441.1750	398.2498	359.5304	341.9727	342.0831 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	85.3067	85.5832	85.8614	87.2803	87.5698	89.0462	89.0462	89.3474	88.4497	87.5698	86.9928	86.4234
alpha	6.6871	6.7055	6.7241	6.8187	6.8380	6.9364	6.9364	6.9565	6.8966	6.8380	6.7995	6.7616
util living area	0.9942	0.9890	0.9697	0.8909	0.7146	0.5030	0.3647	0.4111	0.6733	0.9286	0.9866	0.9954 (86)
MIT	20.3362	20.4415	20.6292	20.8565	20.9725	20.9978	20.9998	20.9996	20.9861	20.8318	20.5531	20.3189 (87)
Th 2	20.2412	20.2434	20.2457	20.2571	20.2594	20.2708	20.2708	20.2731	20.2662	20.2594	20.2548	20.2503 (88)
util rest of house	0.9925	0.9858	0.9609	0.8640	0.6663	0.4467	0.3044	0.3464	0.6087	0.9041	0.9820	0.9941 (89)
MIT 2	19.3577	19.5118	19.7814	20.0975	20.2348	20.2694	20.2707	20.2729	20.2562	20.0740	19.6832	19.3397 (90)
Living area fraction												
MIT	19.8489	19.9785	20.2071	20.4786	20.6051	20.6351	20.6368	20.6377	20.6227	20.4545	20.1199	19.8313 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8489	19.9785	20.2071	20.4786	20.6051	20.6351	20.6368	20.6377	20.6227	20.4545	20.1199	19.8313 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9914	0.9844	0.9604	0.8726	0.6893	0.4749	0.3347	0.3789	0.6407	0.9112	0.9810	0.9931	(94)
Useful gains	352.4429	378.3143	403.6471	407.8292	347.8892	238.3166	159.8413	167.1671	255.1517	327.6147	335.4615	339.7178	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	642.8852	621.4223	563.0690	467.9023	358.6763	239.0492	159.8950	167.2892	260.1023	396.9132	527.8877	637.9400	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	216.0891	163.3686	118.6098	43.2526	8.0256	0.0000	0.0000	0.0000	0.0000	51.5581	138.5469	221.8773	(98)
Space heating													961.3281 (98)
Space heating per m2													(98) / (4) = 18.9275 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	961.3281 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1009.3945 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1920.6539 (310a)
Electricity used for heat distribution	29.3005 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	235.0396 (332)
Total delivered energy for all uses	3287.0792 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3273.7971	0.2160	707.1402 (367)
Electrical energy for heat distribution	29.3005	0.5190	15.2070 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			722.3471 (373)
Space and water heating			722.3471 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	235.0396	0.5190	121.9856 (379)
Total CO2, kg/year			907.6461 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			17.8700 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		17.8700 ZC1
Total Floor Area	TFA	50.7900
Assumed number of occupants	N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.4175 ZC2
CO2 emissions from cooking, equation (L16)		3.1526 ZC3
Total CO2 emissions		38.4401 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		38.4401 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					20.0000 / (5) = 0.1575 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4075 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3464 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4416	0.4330	0.4243	0.3810	0.3724	0.3291	0.3291	0.3204	0.3464	0.3724	0.3897	0.4070 (22b)
	0.5975	0.5937	0.5900	0.5726	0.5693	0.5541	0.5541	0.5513	0.5600	0.5693	0.5759	0.5828 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			10.4200	1.3258	13.8144		(27)					
External Wall	40.6000	10.4200	30.1800	0.1800	5.4324		(29a)					
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)					
Total net area of external elements Aum(A, m2)			58.1000				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	23.9466	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.5926 (36)					
Total fabric heat loss						(33) + (36) =	29.5392 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 25.0373	Feb 24.8786	Mar 24.7230	Apr 23.9925	May 23.8558	Jun 23.2195	Jul 23.2195	Aug 23.1017	Sep 23.4646	Oct 23.8558	Nov 24.1323	Dec 24.4214 (38)
Heat transfer coeff	54.5765	54.4178	54.2622	53.5317	53.3950	52.7587	52.7587	52.6409	53.0038	53.3950	53.6715	53.9606 (39)
Average = Sum(39)m / 12 =												53.5310 (39)
HLP	Jan 1.0746	Feb 1.0714	Mar 1.0684	Apr 1.0540	May 1.0513	Jun 1.0388	Jul 1.0388	Aug 1.0364	Sep 1.0436	Oct 1.0513	Nov 1.0567	Dec 1.0624 (40)
HLP (average)												1.0540 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.3700	11.8751	9.6575	7.3113	5.4653	4.6140	4.9856	6.4805	8.6981	11.0443	12.8903	13.7416	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.0571	317.3814	307.6675	292.1267	276.6192	261.4435	251.4333	256.2414	264.0903	279.8021	297.8468	311.1191	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
Northeast				6.2400	11.2829	0.6300	0.7000			0.7700			21.5169 (75)
East				2.2100	19.6403	0.6300	0.7000			0.7700			13.2651 (76)
Northwest				1.9700	11.2829	0.6300	0.7000			0.7700			6.7930 (81)
Solar gains	41.5750	83.5749	146.5578	232.8333	305.5780	322.5377	303.0224	246.1715	176.2122	101.2141	52.1611	34.0278	83)
Total gains	360.6321	400.9562	454.2252	524.9600	582.1973	583.9812	554.4557	502.4129	440.3026	381.0162	350.0080	345.1469	84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	64.6265	64.8149	65.0007	65.8878	66.0564	66.8531	66.8531	67.0027	66.5440	66.0564	65.7161	65.3641	
alpha	5.3084	5.3210	5.3334	5.3925	5.4038	5.4569	5.4569	5.4668	5.4363	5.4038	5.3811	5.3576	
util living area	0.9956	0.9915	0.9767	0.9174	0.7698	0.5656	0.4166	0.4773	0.7570	0.9550	0.9909	0.9965	(86)
MIT	19.9643	20.1022	20.3559	20.6874	20.9089	20.9861	20.9978	20.9956	20.9389	20.6395	20.2490	19.9428	(87)
Th 2	20.0217	20.0242	20.0268	20.0386	20.0408	20.0512	20.0512	20.0531	20.0472	20.0408	20.0363	20.0316	(88)
util rest of house	0.9942	0.9887	0.9690	0.8920	0.7134	0.4872	0.3279	0.3815	0.6785	0.9355	0.9874	0.9953	(89)
MIT 2	18.6500	18.8521	19.2190	19.6857	19.9581	20.0426	20.0504	20.0514	20.0017	19.6336	19.0756	18.6260	(90)
Living area fraction									fLA = Living area / (4) =			0.5021	(91)
MIT	19.3099	19.4797	19.7898	20.1886	20.4354	20.5163	20.5260	20.5254	20.4722	20.1386	19.6647	19.2871	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3099	19.4797	19.7898	20.1886	20.4354	20.5163	20.5260	20.5254	20.4722	20.1386	19.6647	19.2871	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	358.0257	395.6336	439.1291	470.5782	429.5135	307.2901	206.5299	215.9024	315.0139	357.3198	344.9934	343.1348	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	819.1869	793.3967	721.1333	604.2979	466.4291	312.1359	207.1330	217.1656	337.7521	509.3143	674.3690	814.1100	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	343.1039	267.2968	209.8111	96.2782	27.4652	0.0000	0.0000	0.0000	0.0000	113.0839	237.1504	350.4056	(98)
Space heating												1644.5951	(98)
Space heating per m2												32.3803	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1758.9252 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	343.1039	267.2968	209.8111	96.2782	27.4652	0.0000	0.0000	0.0000	0.0000	113.0839	237.1504	350.4056	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	366.9561	285.8789	224.3969	102.9713	29.3745	0.0000	0.0000	0.0000	0.0000	120.9454	253.6368	374.7653	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	86.6685	86.3567	85.5905	83.8173	81.3893	79.8000	79.8000	79.8000	79.8000	84.1350	85.9613	79.8000	(216)
Fuel for water heating, kWh/month	194.7247	172.4666	183.2625	168.4849	170.5774	156.2471	150.8144	164.4484	163.8315	174.0140	179.2020	190.0402	(219)
Water heating fuel used												2068.1137	(219)
Annual totals kWh/year													
Space heating fuel - main system												1758.9252	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												236.1179	(232)
Total delivered energy for all uses												4138.1568	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1758.9252	0.2160	379.9278 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2068.1137	0.2160	446.7126 (264)
Space and water heating			826.6404 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	236.1179	0.5190	122.5452 (268)
Total CO2, kg/m2/year			988.1106 (272)
Emissions per m2 for space and water heating			16.2757 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4128 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.2757 * 1.00) + 2.4128 + 0.7664, rounded to 2 d.p.			19.4500 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	044	Issued on Date	29/04/2022
Assessment Reference	044	Prop Type Ref	
Property			
SAP Rating	82 B	DER	19.70
Environmental	88 B	TER	21.39
CO ₂ Emissions (t/year)	0.84	% DER<TER	7.89
General Requirements Compliance	Pass	DFEE	48.72
		TFEE	57.58
		% DFEE<TFEE	15.38
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 21.39 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 19.70 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)57.6 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)48.7 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing North East:	6.24 m ² , No overhang
Windows facing East:	2.21 m ² , No overhang
Windows facing North West:	1.97 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			10.4200	1.1450	11.9313		(27)
External Wall	40.6000	10.4200	30.1800	0.1500	4.5270		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Main Roof	50.7900		50.7900	0.1000	5.0790		(30)
Total net area of external elements Aum(A, m ²)			108.8900				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 27.3298		(33)
Party Wall			16.2500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.4552 (36)
Total fabric heat loss							(33) + (36) = 35.7850 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	11.7351	11.6015	11.4680	10.8002	10.6666	9.9988	9.9988	9.8652	10.2659	10.6666	10.9337	11.2009 (38)
Average = Sum(39)m / 12 =	47.5201	47.3865	47.2530	46.5852	46.4516	45.7838	45.7838	45.6502	46.0509	46.4516	46.7187	46.9859 (39)
												46.5518 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9356	0.9330	0.9304	0.9172	0.9146	0.9014	0.9014	0.8988	0.9067	0.9146	0.9198	0.9251 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy content (annual)	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
	Solar input (sum of months) = Sum (63)m =											0.0000 (63)	
Output from w/h													
	177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(64)
	Total per year (kWh/year) = Sum (64)m =											1829.1942 (64)	
Heat gains from water heating, kWh/month													
	84.8430	75.4698	80.8830	74.7574	74.8902	69.2597	68.7450	72.3625	71.2721	77.4089	79.0216	83.5613	(65)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9927	0.9874	0.9700	0.9069	0.7553	0.5393	0.3813	0.4315	0.7096	0.9352	0.9850	0.9940 (94)
Useful gains	352.8922	379.4560	407.6755	423.8558	381.1719	270.6216	182.0994	190.3886	282.5841	336.2252	336.8306	340.0422 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	726.3590	702.3720	636.7748	531.3736	409.3167	273.6775	182.4066	191.0191	296.9523	450.0697	597.6480	721.9731 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	277.8593	216.9995	170.4499	77.4128	20.9397	0.0000	0.0000	0.0000	0.0000	84.7003	187.7885	284.1566 (98)
Space heating												1320.3066 (98)
Space heating per m2												25.9954 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	1320.3066	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1386.3219	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating:		
Annual water heating requirement	1829.1942	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1920.6539	(310a)
Electricity used for heat distribution	33.0698	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	121.9912	(330a)
Total electricity for the above, kWh/year	121.9912	(331)
Electricity for lighting (calculated in Appendix L)	235.0396	(332)
Total delivered energy for all uses	3664.0066	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3694.9450	0.2160	798.1081 (367)
Electrical energy for heat distribution	33.0698	0.5190	17.1632 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			815.2713 (373)
Space and water heating			815.2713 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	235.0396	0.5190	121.9856 (379)
Total CO2, kg/year			1000.5703 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			19.7000 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		19.7000	ZC1
Total Floor Area	TFA	50.7900	
Assumed number of occupants	N	1.7134	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.4175	ZC2
CO2 emissions from cooking, equation (L16)		3.1526	ZC3
Total CO2 emissions		40.2701	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		40.2701	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	+	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1575 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4075 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3464 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4416	0.4330	0.4243	0.3810	0.3724	0.3291	0.3291	0.3204	0.3464	0.3724	0.3897	0.4070 (22b)
Effective ac	0.5975	0.5937	0.5900	0.5726	0.5693	0.5541	0.5541	0.5513	0.5600	0.5693	0.5759	0.5828 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			10.4200	1.3258	13.8144		(27)
External Wall	40.6000	10.4200	30.1800	0.1800	5.4324		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Main Roof	50.7900		50.7900	0.1300	6.6027		(30)
Total net area of external elements Aum(A, m ²)			108.8900				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	30.5493	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.6050 (36)
Total fabric heat loss						(33) + (36) =	37.1543 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	25.0373	24.8786	24.7230	23.9925	23.8558	23.2195	23.2195	23.1017	23.4646	23.8558	24.1323	24.4214 (38)
Heat transfer coeff	62.1916	62.0329	61.8773	61.1468	61.0101	60.3738	60.3738	60.2560	60.6189	61.0101	61.2866	61.5757 (39)
Average = Sum(39)m / 12 =												61.1461 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2245	1.2214	1.2183	1.2039	1.2012	1.1887	1.1887	1.1864	1.1935	1.2012	1.2067	1.2124 (40)
HLP (average)												1.2039 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
Heat gains from water heating, kWh/month	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.3700	11.8751	9.6575	7.3113	5.4653	4.6140	4.9856	6.4805	8.6981	11.0443	12.8903	13.7416	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.0571	317.3814	307.6675	292.1267	276.6192	261.4435	251.4333	256.2414	264.0903	279.8021	297.8468	311.1191	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
Northeast				6.2400	11.2829	0.6300	0.7000			0.7700			21.5169 (75)
East				2.2100	19.6403	0.6300	0.7000			0.7700			13.2651 (76)
Northwest				1.9700	11.2829	0.6300	0.7000			0.7700			6.7930 (81)
Solar gains	41.5750	83.5749	146.5578	232.8333	305.5780	322.5377	303.0224	246.1715	176.2122	101.2141	52.1611	34.0278 (83)	
Total gains	360.6321	400.9562	454.2252	524.9600	582.1973	583.9812	554.4557	502.4129	440.3026	381.0162	350.0080	345.1469 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	56.7132	56.8583	57.0012	57.6822	57.8115	58.4207	58.4207	58.5350	58.1845	57.8115	57.5506	57.2804		
alpha	4.7809	4.7906	4.8001	4.8455	4.8541	4.8947	4.8947	4.9023	4.8790	4.8541	4.8367	4.8187		
util living area	0.9958	0.9924	0.9808	0.9364	0.8183	0.6292	0.4722	0.5379	0.8079	0.9646	0.9920	0.9966	(86)	
MIT	19.7604	19.9033	20.1750	20.5453	20.8333	20.9652	20.9930	20.9873	20.8853	20.5109	20.0763	19.7376	(87)	
Th 2	19.9005	19.9029	19.9054	19.9169	19.9190	19.9291	19.9291	19.9309	19.9252	19.9190	19.9147	19.9101	(88)	
util rest of house	0.9944	0.9898	0.9741	0.9141	0.7620	0.5372	0.3609	0.4198	0.7275	0.9477	0.9888	0.9955	(89)	
MIT 2	18.2663	18.4758	18.8701	19.3971	19.7639	19.9074	19.9266	19.9260	19.8371	19.3624	18.7371	18.2398	(90)	
Living area fraction	19.0164	19.1925	19.5252	19.9736	20.3008	20.4385	20.4620	20.4588	20.3633	19.9390	19.4095	18.9918	(92)	
Temperature adjustment	19.0164	19.1925	19.5252	19.9736	20.3008	20.4385	20.4620	20.4588	20.3633	19.9390	19.4095	18.9918	(92)	
adjusted MIT	19.0164	19.1925	19.5252	19.9736	20.3008	20.4385	20.4620	20.4588	20.3633	19.9390	19.4095	18.9918	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	0.9929	0.9876	0.9711	0.9154	0.7834	0.5823	0.4170	0.4794	0.7632	0.9481	0.9868	0.9942	(94)	
Ext temp.	358.0747	396.0004	441.1144	480.5646	456.1139	340.0500	231.2062	240.8342	336.0334	361.2411	345.3837	343.1426	(95)	
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)	
Month fracti	915.2378	886.6055	805.9668	677.1140	524.7376	352.4906	233.1647	244.5682	379.6771	569.7735	754.4066	910.8126	(97)	
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)	
Space heating per m2	414.5293	329.6866	271.4502	141.5155	51.0561	0.0000	0.0000	0.0000	0.0000	155.1481	294.4965	422.3464	(98)	
												2080.2289	(98)	
												40.9574	(99)	

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2224.8437 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	414.5293	329.6866	271.4502	141.5155	51.0561	0.0000	0.0000	0.0000	0.0000	155.1481	294.4965	422.3464	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	443.3469	352.6060	290.3211	151.3535	54.6054	0.0000	0.0000	0.0000	0.0000	165.9338	314.9695	451.7074	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	87.1202	86.8752	86.2640	84.8194	82.4201	79.8000	79.8000	79.8000	79.8000	84.9686	86.5160	87.2160	(216)
Fuel for water heating, kWh/month	193.7152	171.4373	181.8318	166.4943	168.4440	156.2471	150.8144	164.4484	163.8315	172.3068	178.0529	189.0824	(219)
Water heating fuel used												2056.7062	(219)
Annual totals kWh/year													
Space heating fuel - main system												2224.8437	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												236.1179	(232)
Total delivered energy for all uses												4592.6678	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2224.8437	0.2160	480.5662 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2056.7062	0.2160	444.2485 (264)
Space and water heating			924.8148 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	236.1179	0.5190	122.5452 (268)
Total CO2, kg/m2/year			1086.2850 (272)
Emissions per m2 for space and water heating			18.2086 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4128 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (18.2086 * 1.00) + 2.4128 + 0.7664, rounded to 2 d.p.			21.3900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	045			Issued on Date	29/04/2022
Assessment Reference	045	Prop Type Ref			
Property					
SAP Rating	85 B	DER	15.30	TER	16.45
Environmental	88 B	% DER<TER	7.01		
CO ₂ Emissions (t/year)	1.10	DFEE	40.77	TFEE	47.41
General Requirements Compliance	Fail	% DFEE<TFEE	14.00		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 88 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 16.45 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.30 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)47.4 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)40.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing North East:	12.71 m ² , No overhang
Windows facing East:	1.37 m ² , No overhang
Windows facing South East:	7.38 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	87.5200 (1b)	x 2.5000 (2b)	= 218.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 218.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			21.4600	1.1450	24.5725		(27)
External Wall	45.5300	21.4600	24.0700	0.1500	3.6105		(29a)
Corridor	10.9800	1.8900	9.0900	0.2500	2.2725		(29a)
Main Roof	87.5200		87.5200	0.1000	8.7520		(30)
Total net area of external elements Aum(A, m2)			144.0300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		41.0975		(33)
Party Wall			39.6000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.1896 (36)
Total fabric heat loss						(33) + (36) =	53.2871 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	20.2216	19.9915	19.7613	18.6106	18.3804	17.2297	17.2297	16.9995	17.6900	18.3804	18.8407	19.3010 (38)
Average = Sum(39)m / 12 =	73.5088	73.2786	73.0485	71.8977	71.6675	70.5168	70.5168	70.2866	70.9771	71.6675	72.1279	72.5882 (39)
												71.8402 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8399	0.8373	0.8346	0.8215	0.8189	0.8057	0.8057	0.8031	0.8110	0.8189	0.8241	0.8294 (40)
Days in month												0.8208 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5902 (42)
Average daily hot water use (litres/day)												95.7180 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	105.2898	101.4611	97.6323	93.8036	89.9749	86.1462	86.1462	89.9749	93.8036	97.6323	101.4611	105.2898 (44)
Energy conte	156.1417	136.5625	140.9203	122.8577	117.8849	101.7257	94.2638	108.1691	109.4610	127.5662	139.2485	151.2149 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m	Total = Sum(45)m =											1506.0165 (45)
	23.4213	20.4844	21.1380	18.4287	17.6827	15.2589	14.1396	16.2254	16.4192	19.1349	20.8873	22.6822 (46)

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	211.4185	186.4900	196.1971	176.3514	173.1617	155.2194	149.5406	163.4459	162.9547	182.8430	192.7422	206.4917	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
	Solar input (sum of months) = Sum (63)m =												0.0000 (63)
Output from w/h													
	211.4185	186.4900	196.1971	176.3514	173.1617	155.2194	149.5406	163.4459	162.9547	182.8430	192.7422	206.4917	(64)
	Total per year (kWh/year) = Sum (64)m =												2156.8562 (64)
Heat gains from water heating, kWh/month													
	96.1386	85.3490	91.0774	83.6451	83.4182	76.6187	75.5642	80.1877	79.1907	86.6372	89.0951	94.5004	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.9005	18.5637	15.0970	11.4294	8.5436	7.2129	7.7938	10.1306	13.5973	17.2649	20.1507	21.4814 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	234.4405	236.8732	230.7428	217.6917	201.2171	185.7333	175.3892	172.9564	179.0869	192.1379	208.6125	224.0963 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092 (71)
Water heating gains (Table 5)	129.2185	127.0074	122.4159	116.1738	112.1212	106.4149	101.5647	107.7791	109.9871	116.4479	123.7432	127.0167 (72)
Total internal gains	446.4130	444.2978	430.1091	407.1484	383.7354	361.2145	346.6011	352.7196	364.5248	387.7042	414.3599	434.4479 (73)

[Jan]			Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				
Northeast			12.7100	11.2829	0.4000	0.8000	0.7700	31.8018 (75)				
East			1.3700	19.6403	0.4000	0.8000	0.7700	5.9669 (76)				
Southeast			7.3800	36.7938	0.4000	0.8000	0.7700	60.2164 (77)				
Solar gains	97.9851	178.9767	276.1939	393.4643	486.5955	503.0205	476.6833	404.3119	316.4320	206.3224	119.5802	82.4105 (83)
Total gains	544.3980	623.2745	706.3030	800.6127	870.3309	864.2350	823.2844	757.0316	680.9567	594.0265	533.9401	516.8584 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil/m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	82.6810	82.9407	83.2020	84.5337	84.8052	86.1891	86.1891	86.4713	85.6301	84.8052	84.2640	83.7296
alpha	6.5121	6.5294	6.5468	6.6356	6.6537	6.7459	6.7459	6.7648	6.7087	6.6537	6.6176	6.5820
util living area	0.9972	0.9926	0.9754	0.9022	0.7309	0.5191	0.3765	0.4263	0.6952	0.9456	0.9927	0.9980 (86)
MIT	20.2213	20.3615	20.5784	20.8315	20.9653	20.9969	20.9997	20.9993	20.9813	20.7903	20.4609	20.1981 (87)
Th 2	20.2189	20.2211	20.2234	20.2347	20.2370	20.2484	20.2484	20.2507	20.2438	20.2370	20.2325	20.2279 (88)
util rest of house	0.9963	0.9903	0.9679	0.8766	0.6815	0.4595	0.3124	0.3573	0.6284	0.9250	0.9900	0.9973 (89)
MIT 2	19.1731	19.3787	19.6917	20.0456	20.2058	20.2464	20.2483	20.2504	20.2302	20.0009	19.5331	19.1464 (90)
Living area fraction	19.1731	19.3787	19.6917	20.0456	20.2058	20.2464	20.2483	20.2504	20.2302	20.0009	19.5331	19.1464 (90)
MIT	19.3683	19.5618	19.8569	20.1920	20.3472	20.3862	20.3882	20.3899	20.3701	20.1479	19.7059	19.3423 (91)
Temperature adjustment												0.0000
adjusted MIT	19.3683	19.5618	19.8569	20.1920	20.3472	20.3862	20.3882	20.3899	20.3701	20.1479	19.7059	19.3423 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9950	0.9878	0.9635	0.8750	0.6889	0.4705	0.3244	0.3702	0.6400	0.9222	0.9876	0.9963 (94)
Useful gains	541.6727	615.6718	680.5362	700.5525	599.6006	406.6578	267.0415	280.2206	435.7962	547.7942	527.3194	514.9438 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1107.6554	1074.3949	975.6979	811.8689	619.7255	408.0246	267.1324	280.4341	445.0312	684.2749	909.2348	1099.1485 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	421.0912	308.2619	219.6003	80.1478	14.9729	0.0000	0.0000	0.0000	0.0000	101.5416	274.9791	434.6483 (98)
Space heating												1855.2431 (98)
Space heating per m2										(98) / (4) =		21.1979 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	1855.2431	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1948.0053	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating:		
Annual water heating requirement	2156.8562	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2264.6990	(310a)
Electricity used for heat distribution	42.1270	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	210.2121	(330a)
Total electricity for the above, kWh/year	210.2121	(331)
Electricity for lighting (calculated in Appendix L)	369.1100	(332)
Total delivered energy for all uses	4792.0265	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	4706.9322	0.2160	1016.6974 (367)
Electrical energy for heat distribution	42.1270	0.5190	21.8639 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1038.5613 (373)
Space and water heating			1038.5613 (376)
Pumps and fans	210.2121	0.5190	109.1001 (378)
Energy for lighting	369.1100	0.5190	191.5681 (379)
Total CO2, kg/year			1339.2295 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.3000 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		15.3000	ZC1
Total Floor Area	TFA	87.5200	
Assumed number of occupants	N	2.5902	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		15.8735	ZC2
CO2 emissions from cooking, equation (L16)		2.0700	ZC3
Total CO2 emissions		33.2434	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		33.2434	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	87.5200 (1b)	x 2.5000 (2b)	= 218.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 218.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 30.0000 / (5) = 0.1371 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3871 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3290 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4195	0.4113	0.4031	0.3619	0.3537	0.3126	0.3126	0.3044	0.3290	0.3537	0.3702	0.3866 (22b)
	0.5880	0.5846	0.5812	0.5655	0.5626	0.5489	0.5489	0.5463	0.5541	0.5626	0.5685	0.5747 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			20.0000	1.3258	26.5152		(27)					
External Wall	45.5300	20.0000	25.5300	0.1800	4.5954		(29a)					
Corridor	10.9800	1.8900	9.0900	0.1800	1.6362		(29a)					
Main Roof	87.5200		87.5200	0.1300	11.3776		(30)					
Total net area of external elements Aum(A, m2)			144.0300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	46.0144		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.7258 (36)					
Total fabric heat loss						(33) + (36) =	54.7402 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	42.4562	42.2095	41.9676	40.8316	40.6191	39.6297	39.6297	39.4465	40.0108	40.6191	41.0491	41.4986 (38)
Heat transfer coeff	97.1964	96.9496	96.7078	95.5718	95.3592	94.3698	94.3698	94.1866	94.7509	95.3592	95.7892	96.2387 (39)
Average = Sum(39)m / 12 =												95.5708 (39)
HLP	Jan 1.1106	Feb 1.1077	Mar 1.1050	Apr 1.0920	May 1.0896	Jun 1.0783	Jul 1.0783	Aug 1.0762	Sep 1.0826	Oct 1.0896	Nov 1.0945	Dec 1.0996 (40)
HLP (average)												1.0920 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5902 (42)
Average daily hot water use (litres/day)												95.7180 (43)
Daily hot water use	105.2898	101.4611	97.6323	93.8036	89.9749	86.1462	86.1462	89.9749	93.8036	97.6323	101.4611	105.2898 (44)
Energy conte	156.1417	136.5625	140.9203	122.8577	117.8849	101.7257	94.2638	108.1691	109.4610	127.5662	139.2485	151.2149 (45)
Energy content (annual)										Total = Sum(45)m =		1506.0165 (45)
Distribution loss (46)m = 0.15 x (45)m	23.4213	20.4844	21.1380	18.4287	17.6827	15.2589	14.1396	16.2254	16.4192	19.1349	20.8873	22.6822 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	202.7366	178.6482	187.5152	167.9496	164.4798	146.8176	140.8587	154.7640	154.5528	174.1611	184.3404	197.8098 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	202.7366	178.6482	187.5152	167.9496	164.4798	146.8176	140.8587	154.7640	154.5528	174.1611	184.3404	197.8098 (64)
Heat gains from water heating, kWh/month	89.1930	79.0756	84.1319	76.9237	76.4727	69.8973	68.6186	73.2422	72.4693	79.6917	82.3736	87.5549 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115 (66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.9005	18.5637	15.0970	11.4294	8.5436	7.2129	7.7938	10.1306	13.5973	17.2649	20.1507	21.4814 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	234.4405	236.8732	230.7428	217.6917	201.2171	185.7333	175.3892	172.9564	179.0869	192.1379	208.6125	224.0963 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512 (69)	
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)	
Losses e.g. evaporation (negative values) (Table 5)	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092 (71)	
Water heating gains (Table 5)	119.8831	117.6720	113.0805	106.8384	102.7858	97.0795	92.2294	98.4438	100.6517	107.1125	114.4078	117.6813 (72)	
Total internal gains	440.0776	437.9624	423.7737	400.8130	377.4000	354.8792	340.2657	346.3842	358.1894	381.3688	408.0245	428.1125 (73)	

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
Northeast					11.8500	11.2829	0.6300	0.7000			0.7700			40.8613 (75)
East					1.2800	19.6403	0.6300	0.7000			0.7700			7.6830 (76)
Southeast					6.8700	36.7938	0.6300	0.7000			0.7700			77.2509 (77)
Solar gains	125.7952	229.7908	354.6482	505.2835	624.9212	646.0304	612.1995	519.2294	406.3346	264.9111	153.5227	105.7982	(83)	
Total gains	565.8728	667.7532	778.4220	906.0965	1002.3212	1000.9095	952.4653	865.6137	764.5240	646.2798	561.5471	533.9107	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.5309	62.6901	62.8468	63.5939	63.7356	64.4038	64.4038	64.5291	64.1448	63.7356	63.4495	63.1531	
alpha	5.1687	5.1793	5.1898	5.2396	5.2490	5.2936	5.2936	5.3019	5.2763	5.2490	5.2300	5.2102	
util living area	0.9972	0.9929	0.9785	0.9229	0.7845	0.5862	0.4329	0.4941	0.7684	0.9605	0.9936	0.9979 (86)	
MIT	19.8555	20.0290	20.3069	20.6527	20.8909	20.9813	20.9968	20.9939	20.9280	20.5975	20.1615	19.8260 (87)	
Th 2	19.9922	19.9945	19.9968	20.0074	20.0094	20.0186	20.0186	20.0203	20.0151	20.0094	20.0053	20.0011 (88)	
util rest of house	0.9963	0.9906	0.9712	0.8982	0.7279	0.5036	0.3380	0.3922	0.6887	0.9426	0.9911	0.9972 (89)	
MIT 2	18.4701	18.7243	19.1264	19.6140	19.9096	20.0071	20.0175	20.0180	19.9611	19.5516	18.9263	18.4335 (90)	
Living area fraction	18.7282	18.9673	19.3463	19.8074	20.0924	20.1885	20.1999	20.1997	20.1412	19.7464	19.1563	18.6929 (92)	
Temperature adjustment	18.7282	18.9673	19.3463	19.8074	20.0924	20.1885	20.1999	20.1997	20.1412	19.7464	19.1563	18.6929 (93)	
adjusted MIT	18.7282	18.9673	19.3463	19.8074	20.0924	20.1885	20.1999	20.1997	20.1412	19.7464	19.1563	18.6929 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9945	0.9872	0.9651	0.8924	0.7330	0.5184	0.3557	0.4112	0.6999	0.9366	0.9880	0.9958 (94)	
Ext temp.	562.7631	659.2128	751.2260	808.5679	734.7430	518.8393	338.7894	355.9347	535.1004	605.2783	554.8283	531.6916 (95)	
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Month fracti	1402.3647	1363.8225	1242.3352	1042.4416	800.2884	527.3865	339.7229	357.8845	572.4078	872.1914	1154.8659	1394.7750 (97)	
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)	
Space heating per m2	624.6636	473.4977	365.3852	168.3891	48.7658	0.0000	0.0000	0.0000	0.0000	198.5833	432.0270	642.1340 (98)	
												2953.4459 (98)	
												33.7460 (99)	

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3158.7656 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	624.6636	473.4977	365.3852	168.3891	48.7658	0.0000	0.0000	0.0000	0.0000	198.5833	432.0270	642.1340	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	668.0894	506.4147	390.7864	180.0953	52.1559	0.0000	0.0000	0.0000	0.0000	212.3886	462.0610	686.7744	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	202.7366	178.6482	187.5152	167.9496	164.4798	146.8176	140.8587	154.7640	154.5528	174.1611	184.3404	197.8098	(64)
Efficiency of water heater (217)m	87.6212	87.2936	86.5635	84.8208	82.0176	79.8000	79.8000	79.8000	79.8000	85.1644	87.0107	87.7297	(216)
Fuel for water heating, kWh/month	231.3784	204.6522	216.6214	198.0051	200.5422	183.9819	176.5147	193.9399	193.6752	204.4998	211.8594	225.4764	(219)
Water heating fuel used												2441.1466	(219)
Annual totals kWh/year													
Space heating fuel - main system												3158.7656	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												369.1100	(232)
Total delivered energy for all uses												6044.0222	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3158.7656	0.2160	682.2934 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2441.1466	0.2160	527.2877 (264)
Space and water heating			1209.5810 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	369.1100	0.5190	191.5681 (268)
Total CO2, kg/m2/year			1440.0741 (272)
Emissions per m2 for space and water heating			13.8206 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.1888 (272b)
Emissions per m2 for pumps and fans			0.4448 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.8206 * 1.00) + 2.1888 + 0.4448, rounded to 2 d.p.			16.4500 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	046				Issued on Date	29/04/2022
Assessment Reference	046	Prop Type Ref				
Property						
SAP Rating	85 B	DER	14.76	TER	15.85	
Environmental	88 B	% DER<TER	6.90			
CO ₂ Emissions (t/year)	1.06	DFEE	38.07	TFEE	42.93	
General Requirements Compliance	Pass	% DFEE<TFEE	11.32			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 87 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 15.85 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.76 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)42.9 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)38.1 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing South East:	1.97 m ² , No overhang
Windows facing South:	3.92 m ² , No overhang
Windows facing South West:	8.41 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	87.0000 (1b)	x 2.5000 (2b)	= 217.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 217.5000 (5)

2. Ventilation rate

	main		secondary		other		total		m3 per hour			
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)			
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)			
Number of intermittent fans							0 * 10 =	0.0000	(7a)			
Number of passive vents							0 * 10 =	0.0000	(7b)			
Number of flueless gas fires							0 * 40 =	0.0000	(7c)			
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000	(8)			
Pressure test								Yes				
Measured/design AP50								3.0000				
Infiltration rate								0.1500	(18)			
Number of sides sheltered								2	(19)			
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500	(20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1275	(21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			14.3000	1.1450	16.3740		(27)					
External Wall	44.9800	14.3000	30.6800	0.1500	4.6020		(29a)					
Corridor	15.5500	1.8900	13.6600	0.2500	3.4150		(29a)					
Core	18.2300		18.2300	0.2500	4.5575		(29a)					
Main Roof	87.0000		87.0000	0.1000	8.7000		(30)					
Total net area of external elements Aum(A, m2)			165.7600				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		39.5385		(33)					
Party Wall			18.8500	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.9176 (36)					
Total fabric heat loss						(33) + (36) =	50.4561 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 20.1015	Feb 19.8727	Mar 19.6439	Apr 18.5000	May 18.2712	Jun 17.1273	Jul 17.1273	Aug 16.8985	Sep 17.5849	Oct 18.2712	Nov 18.7288	Dec 19.1864 (38)
Heat transfer coeff	70.5576	70.3288	70.1001	68.9562	68.7274	67.5835	67.5835	67.3547	68.0410	68.7274	69.1849	69.6425 (39)
Average = Sum(39)m / 12 =												68.8990 (39)
HLP	Jan 0.8110	Feb 0.8084	Mar 0.8057	Apr 0.7926	May 0.7900	Jun 0.7768	Jul 0.7768	Aug 0.7742	Sep 0.7821	Oct 0.7900	Nov 0.7952	Dec 0.8005 (40)
HLP (average)												0.7919 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5824 (42)
Average daily hot water use (litres/day)												95.5318 (43)
Daily hot water use	Jan 105.0850	Feb 101.2637	Mar 97.4424	Apr 93.6211	May 89.7999	Jun 85.9786	Jul 85.9786	Aug 89.7999	Sep 93.6211	Oct 97.4424	Nov 101.2637	Dec 105.0850 (44)
Energy conte	155.8380	136.2969	140.6462	122.6187	117.6556	101.5278	94.0805	107.9587	109.2481	127.3181	138.9777	150.9207 (45)
Energy content (annual)										Total = Sum(45)m =		1503.0869 (45)
Distribution loss (46)m = 0.15 x (45)m												

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	23.3757	20.4445	21.0969	18.3928	17.6483	15.2292	14.1121	16.1938	16.3872	19.0977	20.8466	22.6381 (46)
Water storage loss:												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
211.1148	186.2243	195.9230	176.1124	172.9324	155.0215	149.3573	163.2355	162.7418	182.5949	192.4713	206.1975	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h												
211.1148	186.2243	195.9230	176.1124	172.9324	155.0215	149.3573	163.2355	162.7418	182.5949	192.4713	206.1975	(64)
Heat gains from water heating, kWh/month												
96.0376	85.2607	90.9863	83.5657	83.3419	76.5529	75.5032	80.1177	79.1199	86.5547	89.0050	94.4026	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
21.1208	18.7593	15.2561	11.5499	8.6337	7.2889	7.8759	10.2374	13.7406	17.4469	20.3631	21.7078	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
233.4490	235.8715	229.7669	216.7711	200.3661	184.9478	174.6474	172.2249	178.3295	191.3253	207.7303	223.1486	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	(71)
Water heating gains (Table 5)												
129.0827	126.8760	122.2934	116.0634	112.0187	106.3235	101.4828	107.6851	109.8888	116.3370	123.6181	126.8852	(72)
Total internal gains												
445.3884	443.2426	429.0523	406.1202	382.7544	360.2961	345.7420	351.8833	363.6948	386.8451	413.4473	433.4775	(73)

6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains
		m2	Table 6a	or Table 6b	Specific data	factor	W
			W/m2		or Table 6c	Table 6d	
Southeast		1.9700	36.7938	0.4000	0.8000	0.7700	16.0740 (77)
South		3.9200	46.7521	0.4000	0.8000	0.7700	40.6415 (78)
Southwest		8.4100	36.7938	0.4000	0.8000	0.7700	68.6206 (79)

Solar gains	125.3361	210.8266	282.1774	340.4041	373.8044	368.0651	356.0989	331.4779	302.3021	231.2365	149.6187	107.5989 (83)
Total gains	570.7245	654.0692	711.2297	746.5243	756.5588	728.3612	701.8409	683.3612	665.9969	618.0815	563.0660	541.0764 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	85.6274	85.9060	86.1863	87.6161	87.9077	89.3956	89.6993	88.7945	87.9077	87.3263	86.7526	
alpha	6.7085	6.7271	6.7458	6.8411	6.8605	6.9597	6.9597	6.9800	6.9196	6.8605	6.7835	
util living area	0.9960	0.9893	0.9712	0.9155	0.7887	0.5873	0.4231	0.4524	0.6852	0.9267	0.9891	0.9971 (86)
MIT	20.2983	20.4415	20.6249	20.8257	20.9509	20.9945	20.9995	20.9992	20.9848	20.8360	20.5329	20.2731 (87)
Th 2	20.2438	20.2461	20.2484	20.2598	20.2620	20.2735	20.2735	20.2758	20.2689	20.2620	20.2575	20.2529 (88)
util rest of house	0.9948	0.9862	0.9627	0.8924	0.7420	0.5235	0.3536	0.3817	0.6204	0.9018	0.9853	0.9962 (89)
MIT 2	19.3048	19.5139	19.7776	20.0617	20.2162	20.2699	20.2733	20.2754	20.2578	20.0816	19.6565	19.2753 (90)
Living area fraction									fLA = Living area / (4) =			0.1782 (91)
MIT	19.4818	19.6792	19.9286	20.1978	20.3471	20.3990	20.4027	20.4044	20.3873	20.2160	19.8126	19.4531 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4818	19.6792	19.9286	20.1978	20.3471	20.3990	20.4027	20.4044	20.3873	20.2160	19.8126	19.4531 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	566.7894	643.0093	681.6107	664.6185	565.6741	389.4747	256.8468	269.4651	420.4221	556.2896	553.0934	538.3291 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1071.1942	1039.4022	941.3446	779.0561	594.2936	391.9163	256.9965	269.7134	427.7970	660.8811	879.5237	1062.2650 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	375.2771	266.3760	193.2420	82.3950	21.2929	0.0000	0.0000	0.0000	0.0000	77.8161	235.0299	389.8083 (98)
Space heating												1641.2373 (98)
Space heating per m2												18.8648 (99)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1641.2373 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1723.2992 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2153.9267 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2261.6230 (310a)
Electricity used for heat distribution	39.8492 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	208.9631 (330a)
Total electricity for the above, kWh/year	208.9631 (331)
Electricity for lighting (calculated in Appendix L)	373.0005 (332)
Total delivered energy for all uses	4566.8858 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	4452.4271	0.2160	961.7242 (367)
Electrical energy for heat distribution	39.8492	0.5190	20.6817 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			982.4060 (373)
Space and water heating			982.4060 (376)
Pumps and fans	208.9631	0.5190	108.4519 (378)
Energy for lighting	373.0005	0.5190	193.5872 (379)
Total CO2, kg/year			1284.4451 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.7600 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		14.7600 ZC1
Total Floor Area	TFA	87.0000
Assumed number of occupants	N	2.5824
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		15.9008 ZC2
CO2 emissions from cooking, equation (L16)		2.0802 ZC3
Total CO2 emissions		32.7410 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		32.7410 ZC8

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	87.0000 (1b)	x 2.5000 (2b)	= 217.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 217.5000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1379 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3879 (18)
Number of sides sheltered					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3297 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.4204	0.4122	0.4039	0.3627	0.3545	0.3133	0.3133	0.3050	0.3297	0.3545	0.3710	0.3874 (22b)
Effective ac	0.5884	0.5849	0.5816	0.5658	0.5628	0.5491	0.5491	0.5465	0.5544	0.5628	0.5688	0.5751 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900			(26)				
TER Opening Type (Uw = 1.40)			14.3000	1.3258	18.9583			(27)				
External Wall	44.9800	14.3000	30.6800	0.1800	5.5224			(29a)				
Corridor	15.5500	1.8900	13.6600	0.1800	2.4588			(29a)				
Core	18.2300		18.2300	0.1800	3.2814			(29a)				
Main Roof	87.0000		87.0000	0.1300	11.3100			(30)				
Total net area of external elements Aum(A, m ²)			165.7600					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	43.4209			(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								8.5358 (36)				
Total fabric heat loss						(33) + (36) =		51.9567 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 42.2307	Feb 41.9844	Mar 41.7430	Apr 40.6090	May 40.3968	Jun 39.4091	Jul 39.4091	Aug 39.2262	Sep 39.7895	Oct 40.3968	Nov 40.8260	Dec 41.2747 (38)
Heat transfer coeff	94.1875	93.9411	93.6997	92.5657	92.3535	91.3658	91.3658	91.1829	91.7463	92.3535	92.7827	93.2315 (39)
Average = Sum(39)m / 12 =												92.5647 (39)
HLP	Jan 1.0826	Feb 1.0798	Mar 1.0770	Apr 1.0640	May 1.0615	Jun 1.0502	Jul 1.0502	Aug 1.0481	Sep 1.0546	Oct 1.0615	Nov 1.0665	Dec 1.0716 (40)
HLP (average)												1.0640 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5824 (42)
Average daily hot water use (litres/day)												95.5318 (43)
Daily hot water use	105.0850	101.2637	97.4424	93.6211	89.7999	85.9786	85.9786	89.7999	93.6211	97.4424	101.2637	105.0850 (44)
Energy conte	155.8380	136.2969	140.6462	122.6187	117.6556	101.5278	94.0805	107.9587	109.2481	127.3181	138.9777	150.9207 (45)
Energy content (annual)										Total = Sum(45)m =		1503.0869 (45)
Distribution loss (46)m = 0.15 x (45)m												
	23.3757	20.4445	21.0969	18.3928	17.6483	15.2292	14.1121	16.1938	16.3872	19.0977	20.8466	22.6381 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

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Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	202.4329	178.3826	187.2411	167.7106	164.2505	146.6197	140.6754	154.5536	154.3399	173.9130	184.0695	197.5156 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	202.4329	178.3826	187.2411	167.7106	164.2505	146.6197	140.6754	154.5536	154.3399	173.9130	184.0695	197.5156 (64)
Heat gains from water heating, kWh/month	89.0920	78.9873	84.0408	76.8442	76.3964	69.8315	68.5577	73.1722	72.3985	79.6092	82.2835	87.4571 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)m
(66)m	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.5997	19.1847	15.6020	11.8117	8.8294	7.4542	8.0545	10.4695	14.0522	17.8425	20.8248	22.2000	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	233.4490	235.8715	229.7669	216.7711	200.3661	184.9478	174.6474	172.2249	178.3295	191.3253	207.7303	223.1486	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	(71)
Water heating gains (Table 5)	119.7474	117.5406	112.9580	106.7281	102.6833	96.9882	92.1474	98.3497	100.5534	107.0016	114.2827	117.5498	(72)
Total internal gains	439.5320	437.3326	423.0628	400.0467	376.6147	354.1260	339.5852	345.7801	357.6709	380.9053	407.5736	427.6343	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	

Southeast					1.9700	36.7938		0.6300	0.7000	0.7700		22.1520 (77)	
South					3.9200	46.7521		0.6300	0.7000	0.7700		56.0091 (78)	
Southwest					8.4100	36.7938		0.6300	0.7000	0.7700		94.5677 (79)	

Solar gains	172.7288	290.5453	388.8757	469.1194	515.1492	507.2397	490.7488	456.8180	416.6101	318.6728	206.1932	148.2848	(83)
Total gains	612.2608	727.8780	811.9386	869.1661	891.7639	861.3657	830.3340	802.5980	774.2810	699.5780	613.7669	575.9191	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	64.1451	64.3133	64.4790	65.2690	65.4189	66.1261	66.1261	66.2588	65.8519	65.4189	65.1163	64.8029
alpha	5.2763	5.2876	5.2986	5.3513	5.3613	5.4084	5.4084	5.4173	5.3901	5.3613	5.3411	5.3202
util living area	0.9958	0.9890	0.9726	0.9279	0.8265	0.6496	0.4792	0.5151	0.7480	0.9427	0.9900	0.9969 (86)
MIT	19.9473	20.1334	20.3776	20.6562	20.8664	20.9723	20.9954	20.9933	20.9408	20.6698	20.2523	19.9135 (87)
Th 2	20.0151	20.0174	20.0197	20.0304	20.0324	20.0417	20.0417	20.0435	20.0381	20.0324	20.0283	20.0241 (88)
util rest of house	0.9944	0.9856	0.9638	0.9047	0.7747	0.5643	0.3775	0.4119	0.6686	0.9192	0.9862	0.9959 (89)
MIT 2	18.6203	18.8918	19.2437	19.6385	19.9060	20.0239	20.0401	20.0408	19.9944	19.6659	19.0743	18.5777 (90)
Living area fraction									fLA =	Living area / (4) =		
MIT	18.8567	19.1130	19.4457	19.8198	20.0771	20.1928	20.2103	20.2105	20.1630	19.8447	19.2841	18.8157 (91)
Temperature adjustment												0.0000
adjusted MIT	18.8567	19.1130	19.4457	19.8198	20.0771	20.1928	20.2103	20.2105	20.1630	19.8447	19.2841	18.8157 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	607.4144	714.1873	777.1670	781.1171	693.2492	498.2046	328.5036	345.3315	526.2914	639.1239	602.7933	572.5007	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1371.0607	1335.1880	1213.0100	1010.7996	773.6545	510.9941	329.8565	347.4540	556.2613	853.7847	1130.4779	1362.6414	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	568.1529	417.3125	324.2672	165.3714	59.8216	0.0000	0.0000	0.0000	0.0000	159.7076	379.9329	587.8647	(98)
Space heating												2662.4308	(98)
Space heating per m2												30.6027	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2847.5195 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	568.1529	417.3125	324.2672	165.3714	59.8216	0.0000	0.0000	0.0000	0.0000	159.7076	379.9329	587.8647	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	607.6501	446.3235	346.8098	176.8678	63.9803	0.0000	0.0000	0.0000	0.0000	170.8103	406.3454	628.7323	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	202.4329	178.3826	187.2411	167.7106	164.2505	146.6197	140.6754	154.5536	154.3399	173.9130	184.0695	197.5156	(64)
Efficiency of water heater (217)m	87.4207	87.0065	86.2658	84.7765	82.4010	79.8000	79.8000	79.8000	79.8000	84.5876	86.7057	79.8000	(216)
Fuel for water heating, kWh/month	231.5618	205.0222	217.0513	197.8268	199.3307	183.7339	176.2849	193.6762	193.4084	205.6012	212.2922	225.6090	(219)
Water heating fuel used												2441.3986	(219)
Annual totals kWh/year													
Space heating fuel - main system												2847.5195	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												381.4579	(232)
Total delivered energy for all uses												5745.3760	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2847.5195	0.2160	615.0642 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2441.3986	0.2160	527.3421 (264)
Space and water heating			1142.4063 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	381.4579	0.5190	197.9766 (268)
Total CO2, kg/m2/year			1379.3080 (272)
Emissions per m2 for space and water heating			13.1311 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2756 (272b)
Emissions per m2 for pumps and fans			0.4474 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.1311 * 1.00) + 2.2756 + 0.4474, rounded to 2 d.p.			15.8500 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	047	Issued on Date	29/04/2022
Assessment Reference	047	Prop Type Ref	
Property			
SAP Rating	82 B	DER	19.82
Environmental	87 B	TER	20.91
CO ₂ Emissions (t/year)	0.85	% DER<TER	5.22
General Requirements Compliance	Pass	DFEE	49.70
		TFEE	54.20
		% DFEE<TFEE	8.31
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Ground-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 20.91 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 19.82 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)54.2 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)49.7 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.22 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing South East:	6.24 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.8200 (1b)	x 2.8000 (2b)	= 142.2960 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 142.2960 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					0.0000 / (5) = 0.0000 (8)
Measured/design AP50					Yes
Infiltration rate					3.0000
Number of sides sheltered					0.1500 (18)
					3 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)
Ground Floor			50.8200	0.1000	5.0820		(28a)
External Wall	25.7000	8.4500	17.2500	0.1500	2.5875		(29a)
Corridor	39.3700	1.8900	37.4800	0.2500	9.3700		(29a)
Total net area of external elements Aum(A, m ²)			115.8900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.6051		(33)
Party Wall 1			18.3700	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.4650 (36)
Total fabric heat loss						(33) + (36) =	38.0701 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	12.4775	12.3411	12.2046	11.5222	11.3858	10.7034	10.7034	10.5669	10.9764	11.3858	11.6587	11.9317 (38)
Average = Sum(39)m / 12 =	50.5476	50.4111	50.2747	49.5923	49.4558	48.7735	48.7735	48.6370	49.0464	49.4558	49.7288	50.0017 (39)
												49.5582 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9946	0.9920	0.9893	0.9758	0.9732	0.9597	0.9597	0.9570	0.9651	0.9732	0.9785	0.9839 (40)
Days in month												0.9752 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7143 (42)
Average daily hot water use (litres/day)												74.9137 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.4051	79.4086	76.4120	73.4155	70.4189	67.4224	67.4224	70.4189	73.4155	76.4120	79.4086	82.4051 (44)
Energy content (annual)	122.2044	106.8808	110.2914	96.1547	92.2627	79.6157	73.7757	84.6586	85.6697	99.8398	108.9830	118.3484 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1178.6849 (45)
	18.3307	16.0321	16.5437	14.4232	13.8394	11.9424	11.0663	12.6988	12.8505	14.9760	16.3474	17.7523 (46)

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	177.4812	156.8082	165.5682	149.6484	147.5395	133.1094	129.0525	139.9354	139.1634	155.1166	162.4766	173.6253	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum (63)m =					0.0000 (63)
Output from w/h													
	177.4812	156.8082	165.5682	149.6484	147.5395	133.1094	129.0525	139.9354	139.1634	155.1166	162.4766	173.6253	(64)
												Total per year (kWh/year) = Sum (64)m =	1829.5247 (64)
Heat gains from water heating, kWh/month													
	84.8544	75.4798	80.8933	74.7664	74.8988	69.2672	68.7518	72.3704	71.2801	77.4182	79.0318	83.5723	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.7131	85.7131	85.7131	85.7131	85.7131	85.7131	85.7131	85.7131	85.7131	85.7131	85.7131	85.7131 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.4920	11.9835	9.7456	7.3781	5.5152	4.6562	5.0311	6.5397	8.7775	11.1451	13.0080	13.8670 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.3634	150.9134	147.0076	138.6927	128.1966	118.3318	111.7415	110.1916	114.0973	122.4122	132.9083	142.7731 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5713	31.5713	31.5713	31.5713	31.5713	31.5713	31.5713	31.5713	31.5713	31.5713	31.5713	31.5713 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705 (71)
Water heating gains (Table 5)	114.0516	112.3211	108.7276	103.8422	100.6704	96.2044	92.4084	97.2721	99.0002	104.0567	109.7664	112.3284 (72)
Total internal gains	325.6210	323.9319	314.1948	298.6269	283.0962	267.9063	257.8950	262.7173	270.5890	286.3280	304.3966	317.6824 (73)

[Jan				Area	Solar flux		g		FF		Access		Gains
				m2	Table 6a		Table 6b		Table 6c		factor		W
					W/m2		or Table 6b		or Table 6c		Table 6d		
Southeast				6.2400	36.7938		0.4000		0.8000		0.7700		50.9147 (77)
South				2.2100	46.7521		0.4000		0.8000		0.7700		22.9127 (78)
Solar gains	73.8274	124.2516	166.4633	201.0539	220.9821	217.6723	210.5612	195.8614	178.4200	136.3256	88.1434	63.3710 (83)	
Total gains	399.4484	448.1835	480.6581	499.6808	504.0783	485.5786	468.4562	458.5787	449.0090	422.6536	392.5400	381.0535 (84)	

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil/m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	69.8187	70.0077	70.1977	71.1636	71.3600	72.3583	72.3583	72.5613	71.9556	71.3600	70.9683	70.5809
alpha	5.6546	5.6672	5.6798	5.7442	5.7573	5.8239	5.8239	5.8374	5.7970	5.7573	5.7312	5.7054
util living area	0.9923	0.9842	0.9659	0.9176	0.8103	0.6244	0.4555	0.4841	0.7115	0.9216	0.9827	0.9940 (86)
MIT	20.1484	20.2950	20.4961	20.7298	20.9017	20.9829	20.9976	20.9966	20.9637	20.7617	20.4173	20.1210 (87)
Th 2	20.0878	20.0900	20.0923	20.1035	20.1058	20.1170	20.1170	20.1193	20.1125	20.1058	20.1013	20.0968 (88)
util rest of house	0.9899	0.9795	0.9556	0.8929	0.7592	0.5461	0.3655	0.3934	0.6359	0.8933	0.9767	0.9921 (89)
MIT 2	18.9663	19.1794	19.4676	19.7976	20.0135	20.1060	20.1161	20.1179	20.0862	19.8469	19.3660	18.9334 (90)
Living area fraction									fLA = Living area / (4) =			0.5024 (91)
MIT	19.5602	19.7398	19.9842	20.2659	20.4597	20.5465	20.5590	20.5594	20.5271	20.3065	19.8942	19.5300 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5602	19.7398	19.9842	20.2659	20.4597	20.5465	20.5590	20.5594	20.5271	20.3065	19.8942	19.5300 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9882	0.9773	0.9541	0.8979	0.7806	0.5850	0.4108	0.4391	0.6725	0.9005	0.9750	0.9906 (94)
Useful gains	394.7272	437.9964	458.6035	448.6475	393.4846	284.0475	192.4405	201.3438	301.9429	380.5793	382.7171	377.4671 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	771.3643	748.0935	677.9155	563.6615	433.2179	290.0326	193.0928	202.2992	315.2244	480.0414	636.2377	766.5247 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	280.2180	208.3852	163.1681	82.8101	29.5616	0.0000	0.0000	0.0000	0.0000	73.9998	182.5348	289.4589 (98)
Space heating												1310.1365 (98)
Space heating per m2												25.7799 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1310.1365 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1375.6434 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.5247 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1921.0009 (310a)
Electricity used for heat distribution	32.9664 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	136.7109 (330a)
Total electricity for the above, kWh/year	136.7109 (331)
Electricity for lighting (calculated in Appendix L)	238.2733 (332)
Total delivered energy for all uses	3671.6285 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3683.4014	0.2160	795.6147 (367)
Electrical energy for heat distribution	32.9664	0.5190	17.1096 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			812.7243 (373)
Space and water heating			812.7243 (376)
Pumps and fans	136.7109	0.5190	70.9529 (378)
Energy for lighting	238.2733	0.5190	123.6639 (379)
Total CO2, kg/year			1007.3411 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			19.8200 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		19.8200 ZC1
Total Floor Area	TFA	50.8200
Assumed number of occupants	N	1.7143
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.4163 ZC2
CO2 emissions from cooking, equation (L16)		3.1512 ZC3
Total CO2 emissions		40.3875 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		40.3875 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.8200 (1b)	x 2.8000 (2b)	= 142.2960 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 142.2960 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1406 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3906 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3027 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.3859	0.3783	0.3708	0.3329	0.3254	0.2875	0.2875	0.2800	0.3027	0.3254	0.3405	0.3556 (22b)
Effective ac	0.5745	0.5716	0.5687	0.5554	0.5529	0.5413	0.5413	0.5392	0.5458	0.5529	0.5580	0.5632 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)
Ground Floor			50.8200	0.1300	6.6066		(28a)
External Wall	25.7000	8.4500	17.2500	0.1800	3.1050		(29a)
Corridor	39.3700	1.8900	37.4800	0.1800	6.7464		(29a)
Total net area of external elements Aum(A, m ²)			115.8900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.5507		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.9910 (36)
Total fabric heat loss						(33) + (36) =	37.5417 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	26.9755	26.8398	26.7067	26.0815	25.9646	25.4201	25.4201	25.3193	25.6298	25.9646	26.2012	26.4485 (38)
Heat transfer coeff	64.5172	64.3814	64.2483	63.6232	63.5062	62.9618	62.9618	62.8609	63.1715	63.5062	63.7428	63.9902 (39)
Average = Sum(39)m / 12 =												63.6226 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2695	1.2669	1.2642	1.2519	1.2496	1.2389	1.2389	1.2369	1.2430	1.2496	1.2543	1.2592 (40)
HLP (average)												1.2519 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7143 (42)
Average daily hot water use (litres/day)												74.9137 (43)
Daily hot water use	82.4051	79.4086	76.4120	73.4155	70.4189	67.4224	67.4224	70.4189	73.4155	76.4120	79.4086	82.4051 (44)
Energy conte	122.2044	106.8808	110.2914	96.1547	92.2627	79.6157	73.7757	84.6586	85.6697	99.8398	108.9830	118.3484 (45)
Energy content (annual)										Total = Sum(45)m =		1178.6849 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3307	16.0321	16.5437	14.4232	13.8394	11.9424	11.0663	12.6988	12.8505	14.9760	16.3474	17.7523 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	168.7993	148.9665	156.8863	141.2465	138.8576	124.7075	120.3706	131.2535	130.7616	146.4347	154.0748	164.9434 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	168.7993	148.9665	156.8863	141.2465	138.8576	124.7075	120.3706	131.2535	130.7616	146.4347	154.0748	164.9434 (64)
Heat gains from water heating, kWh/month	77.9089	69.2064	73.9478	68.0449	67.9533	62.5457	61.8063	65.4249	64.5587	70.4727	72.3103	76.6268 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.7131	85.7131	85.7131	85.7131	85.7131	85.7131	85.7131	85.7131	85.7131	85.7131	85.7131	85.7131 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7897	12.2479	9.9606	7.5408	5.6369	4.7589	5.1421	6.6840	8.9712	11.3910	13.2950	14.1729 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.3634	150.9134	147.0076	138.6927	128.1966	118.3318	111.7415	110.1916	114.0973	122.4122	132.9083	142.7731 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5713	31.5713	31.5713	31.5713	31.5713	31.5713	31.5713	31.5713	31.5713	31.5713	31.5713	31.5713 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705 (71)
Water heating gains (Table 5)	104.7162	102.9858	99.3922	94.5068	91.3350	86.8690	83.0730	87.9367	89.6648	94.7213	100.4310	102.9930 (72)
Total internal gains	319.5833	317.8609	308.0744	292.4543	276.8825	261.6737	251.6706	256.5262	264.4473	280.2385	298.3482	311.6530 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W	
Southeast				6.2400	36.7938	0.6300	0.7000	0.7700			70.1668 (77)	
South				2.2100	46.7521	0.6300	0.7000	0.7700			31.5766 (78)	

Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains	421.3267	489.0952	537.4816	569.5317	581.4234	561.6534	541.8503	526.4477	510.3323	468.1122	419.8208	398.9862 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	54.7012	54.8165	54.9301	55.4698	55.5720	56.0525	56.0525	56.1425	55.8665	55.5720	55.3657	55.1517
alpha	4.6467	4.6544	4.6620	4.6980	4.7048	4.7368	4.7368	4.7428	4.7244	4.7048	4.6910	4.6768
util living area	0.9922	0.9838	0.9659	0.9230	0.8311	0.6680	0.5006	0.5343	0.7546	0.9329	0.9839	0.9939 (86)
MIT	19.8074	19.9950	20.2533	20.5570	20.8051	20.9495	20.9895	20.9857	20.9077	20.5939	20.1423	19.7706 (87)
Th 2	19.8648	19.8669	19.8690	19.8787	19.8805	19.8890	19.8890	19.8906	19.8857	19.8805	19.8768	19.8730 (88)
util rest of house	0.9897	0.9786	0.9547	0.8971	0.7753	0.5715	0.3797	0.4129	0.6669	0.9048	0.9778	0.9919 (89)
MIT 2	18.3092	18.5816	18.9521	19.3802	19.6978	19.8570	19.8854	19.8852	19.8188	19.4397	18.8039	18.2616 (90)
Living area fraction									fLA = Living area / (4) =			0.5024 (91)
MIT	19.0618	19.2916	19.6058	19.9714	20.2541	20.4059	20.4401	20.4380	20.3658	20.0195	19.4763	19.0196 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0618	19.2916	19.6058	19.9714	20.2541	20.4059	20.4401	20.4380	20.3658	20.0195	19.4763	19.0196 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	415.9631	476.9658	511.4569	512.3071	462.5660	347.3064	238.8196	249.6388	360.9378	425.4711	409.3454	394.9255 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	952.3927	926.5534	842.0262	704.3965	543.2361	365.5478	241.7772	253.8347	395.8215	598.1974	788.8986	948.3119 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	399.1036	302.1228	245.9436	138.3044	60.0185	0.0000	0.0000	0.0000	0.0000	128.5084	273.2783	411.7195 (98)
Space heating												1958.9991 (98)
Space heating per m2										(98) / (4) =		38.5478 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2095.1862 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	399.1036	302.1228	245.9436	138.3044	60.0185	0.0000	0.0000	0.0000	0.0000	128.5084	273.2783	411.7195	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	426.8488	323.1260	263.0412	147.9192	64.1909	0.0000	0.0000	0.0000	0.0000	137.4421	292.2763	440.3417	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7993	148.9665	156.8863	141.2465	138.8576	124.7075	120.3706	131.2535	130.7616	146.4347	154.0748	164.9434	(64)
Efficiency of water heater (217)m	87.0314	86.6626	86.0086	84.7578	82.7527	79.8000	79.8000	79.8000	79.8000	84.4678	86.3268	79.8000	(216)
Fuel for water heating, kWh/month	193.9522	171.8925	182.4077	166.6472	167.7983	156.2751	150.8403	164.4781	163.8616	173.3615	178.4786	189.2479	(219)
Water heating fuel used												2059.2411	(219)
Annual totals kWh/year													
Space heating fuel - main system												2095.1862	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.5302	(232)
Total delivered energy for all uses												4472.9575	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2095.1862	0.2160	452.5602 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2059.2411	0.2160	444.7961 (264)
Space and water heating			897.3563 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.5302	0.5190	126.3922 (268)
Total CO2, kg/m2/year			1062.6735 (272)
Emissions per m2 for space and water heating			17.6575 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4871 (272b)
Emissions per m2 for pumps and fans			0.7659 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.6575 * 1.00) + 2.4871 + 0.7659, rounded to 2 d.p.			20.9100 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	048	Issued on Date	29/04/2022
Assessment Reference	048	Prop Type Ref	
Property			
SAP Rating	83 B	DER	17.29
Environmental	87 B	TER	18.64
CO ₂ Emissions (t/year)	1.00	% DER<TER	7.27
General Requirements Compliance	Pass	DFEE	44.80
		TFEE	51.93
		% DFEE<TFEE	13.72
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Ground-floor flat, total floor area 70 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 18.64 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 17.29 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)51.9 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)44.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing South East:	6.24 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Windows facing South West:	5.10 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	69.6200 (1b)	x 2.8000 (2b)	= 194.9360 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 194.9360 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
Door			1.8900	1.0000	1.8900		(26)						
Window (Uw = 1.20)			13.5500	1.1450	15.5153		(27)						
Ground Floor			69.6200	0.1000	6.9620		(28a)						
External Wall	51.5200	13.5500	37.9700	0.1500	5.6955		(29a)						
Corridor	7.6200	1.8900	5.7300	0.2500	1.4325		(29a)						
Unheated	19.4000		19.4000	0.2000	3.8800		(29a)						
Total net area of external elements Aum(A, m2)			148.1600				(31)						
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		35.3753		(33)						
Party Wall 1			20.5800	0.0000	0.0000		(32)						
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.8220 (36)						
Total fabric heat loss						(33) + (36) =	47.1973 (37)						
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	18.0161	17.8111	17.6060	16.5808	16.3757	15.3505	15.3505	15.1454	15.7606	16.3757	16.7858	17.1959 (38)	
Heat transfer coeff	65.2134	65.0083	64.8033	63.7780	63.5730	62.5477	62.5477	62.3427	62.9578	63.5730	63.9831	64.3932 (39)	
Average = Sum(39)m / 12 =						63.7268 (39)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9367	0.9338	0.9308	0.9161	0.9131	0.8984	0.8984	0.8955	0.9043	0.9131	0.9190	0.9249 (40)	
HLP (average)													0.9154 (40)
Days in month													
	31	28	31	30	31	30	31	31	30	31	30	31 (41)	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2369 (42)
Average daily hot water use (litres/day)												87.3255 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	96.0581	92.5651	89.0720	85.5790	82.0860	78.5930	78.5930	82.0860	85.5790	89.0720	92.5651	96.0581 (44)
Energy conte	142.4513	124.5889	128.5645	112.0857	107.5489	92.8065	85.9989	98.6850	99.8636	116.3814	127.0394	137.9565 (45)
Energy content (annual)												Total = Sum(45)m = 1373.9704 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	21.3677	18.6883	19.2847	16.8129	16.1323	13.9210	12.8998	14.8027	14.9795	17.4572	19.0559	20.6935 (46)
Water storage loss:												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
197.7281	174.5163	183.8413	165.5794	162.8257	146.3002	141.2757	153.9618	153.3573	171.6582	180.5330	193.2333	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h												
197.7281	174.5163	183.8413	165.5794	162.8257	146.3002	141.2757	153.9618	153.3573	171.6582	180.5330	193.2333	(64)
Heat gains from water heating, kWh/month												
91.5865	81.3677	86.9692	80.0634	79.9814	73.6531	72.8161	77.0342	75.9996	82.9182	85.0355	90.0920	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
111.8432	111.8432	111.8432	111.8432	111.8432	111.8432	111.8432	111.8432	111.8432	111.8432	111.8432	111.8432	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
17.5108	15.5530	12.6485	9.5757	7.1580	6.0431	6.5297	8.4876	11.3921	14.4648	16.8826	17.9975	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
196.4085	198.4467	193.3107	182.3768	168.5748	155.6028	146.9368	144.8987	150.0346	160.9685	174.7705	187.7425	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.1843	34.1843	34.1843	34.1843	34.1843	34.1843	34.1843	34.1843	34.1843	34.1843	34.1843	34.1843	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-89.4746	-89.4746	-89.4746	-89.4746	-89.4746	-89.4746	-89.4746	-89.4746	-89.4746	-89.4746	-89.4746	-89.4746	(71)
Water heating gains (Table 5)												
123.1002	121.0829	116.8940	111.1992	107.5019	102.2960	97.8711	103.5406	105.5550	111.4493	118.1049	121.0914	(72)
Total internal gains												
393.5725	391.6355	379.4062	359.7047	339.7877	320.4949	307.8905	313.4798	323.5346	343.4355	366.3110	383.3843	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Southeast				6.2400	36.7938	0.4000	0.8000	0.7700	50.9147 (77)			
South				2.2100	46.7521	0.4000	0.8000	0.7700	22.9127 (78)			
Southwest				5.1000	36.7938	0.4000	0.8000	0.7700	41.6129 (79)			
Solar gains	115.4403	195.1338	263.4475	321.2220	355.5803	351.2973	339.3899	313.9245	283.4333	214.6656	137.9861	98.9830 (83)
Total gains	509.0128	586.7694	642.8536	680.9267	695.3680	671.7921	647.2804	627.4044	606.9680	558.1011	504.2971	482.3673 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	74.1370	74.3708	74.6061	75.8054	76.0499	77.2965	77.2965	77.5507	76.7930	75.5625	75.0813		
alpha	5.9425	5.9581	5.9737	6.0537	6.0700	6.1531	6.1531	6.1700	6.1195	6.0700	6.0375		
util living area	0.9942	0.9858	0.9648	0.9060	0.7805	0.5857	0.4239	0.4551	0.6868	0.9202	0.9856	0.9956	(86)
MIT	20.1817	20.3425	20.5512	20.7819	20.9317	20.9903	20.9988	20.9982	20.9752	20.7919	20.4475	20.1539	(87)
Th 2	20.1364	20.1389	20.1414	20.1538	20.1563	20.1688	20.1688	20.1714	20.1638	20.1563	20.1514	20.1464	(88)
util rest of house	0.9924	0.9815	0.9544	0.8798	0.7292	0.5141	0.3445	0.3742	0.6148	0.8923	0.9806	0.9943	(89)
MIT 2	19.0518	19.2859	19.5847	19.9089	20.0933	20.1627	20.1684	20.1706	20.1460	19.9301	19.4489	19.0190	(90)
Living area fraction									fLA = Living area / (4) =			0.4122	(91)
MIT	19.5176	19.7215	19.9831	20.2688	20.4389	20.5039	20.5107	20.5118	20.4878	20.2854	19.8606	19.4868	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5176	19.7215	19.9831	20.2688	20.4389	20.5039	20.5107	20.5118	20.4878	20.2854	19.8606	19.4868	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9907	0.9790	0.9521	0.8837	0.7472	0.5434	0.3773	0.4076	0.6436	0.8971	0.9784	0.9929	(94)
Useful gains	504.2756	574.4288	612.0683	601.7460	519.6085	365.0290	244.2261	255.7343	390.6177	500.6571	493.4161	478.9513	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	992.3920	963.5184	873.7520	725.0792	555.5588	369.2733	244.6083	256.3410	402.1643	615.7291	816.4626	984.3660	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	363.1586	261.4682	194.6926	88.7999	26.7470	0.0000	0.0000	0.0000	0.0000	85.6136	232.5935	376.0285	(98)
Space heating												1629.1020	(98)
Space heating per m2												23.3999	(99)
										(98) / (4) =			

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1629.1020 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1710.5571 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2024.8102 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2126.0507 (310a)
Electricity used for heat distribution	38.3661 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	187.2848 (330a)
Total electricity for the above, kWh/year	187.2848 (331)
Electricity for lighting (calculated in Appendix L)	309.2466 (332)
Total delivered energy for all uses	4333.1392 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	4286.7127	0.2160	925.9299 (367)
Electrical energy for heat distribution	38.3661	0.5190	19.9120 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			945.8419 (373)
Space and water heating			945.8419 (376)
Pumps and fans	187.2848	0.5190	97.2008 (378)
Energy for lighting	309.2466	0.5190	160.4990 (379)
Total CO2, kg/year			1203.5417 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			17.2900 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		17.2900 ZC1
Total Floor Area	TFA	69.6200
Assumed number of occupants	N	2.2369
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.7175 ZC2
CO2 emissions from cooking, equation (L16)		2.4804 ZC3
Total CO2 emissions		36.4879 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		36.4879 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	69.6200 (1b)	x 2.8000 (2b)	= 194.9360 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 194.9360 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) = 0.1026 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3526 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2997 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3821	0.3746	0.3671	0.3297	0.3222	0.2847	0.2847	0.2772	0.2997	0.3222	0.3372	0.3522 (22b)
Effective ac	0.5730	0.5702	0.5674	0.5543	0.5519	0.5405	0.5405	0.5384	0.5449	0.5519	0.5568	0.5620 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			13.5500	1.3258	17.9640			(27)					
Ground Floor			69.6200	0.1300	9.0506			(28a)					
External Wall	51.5200	13.5500	37.9700	0.1800	6.8346			(29a)					
Corridor	7.6200	1.8900	5.7300	0.1800	1.0314			(29a)					
Unheated	19.4000		19.4000	0.1800	3.4920			(29a)					
Total net area of external elements Aum(A, m2)			148.1600					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		40.2626			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								9.9685 (36)					
Total fabric heat loss						(33) + (36) =		50.2311 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 36.8611	Feb 36.6788	Mar 36.5000	Apr 35.6603	May 35.5032	Jun 34.7719	Jul 34.7719	Aug 34.6365	Sep 35.0536	Oct 35.5032	Nov 35.8210	Dec 36.1533	(38)
Heat transfer coeff	87.0923	86.9099	86.7311	85.8914	85.7344	85.0030	85.0030	84.8676	85.2847	85.7344	86.0522	86.3844	(39)
Average = Sum(39)m / 12 =												85.8907	(39)
HLP	Jan 1.2510	Feb 1.2483	Mar 1.2458	Apr 1.2337	May 1.2315	Jun 1.2210	Jul 1.2210	Aug 1.2190	Sep 1.2250	Oct 1.2315	Nov 1.2360	Dec 1.2408	(40)
HLP (average)												1.2337	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2369 (42)
Average daily hot water use (litres/day)												87.3255 (43)
Daily hot water use	96.0581	92.5651	89.0720	85.5790	82.0860	78.5930	78.5930	82.0860	85.5790	89.0720	92.5651	96.0581 (44)
Energy conte	142.4513	124.5889	128.5645	112.0857	107.5489	92.8065	85.9989	98.6850	99.8636	116.3814	127.0394	137.9565 (45)
Energy content (annual)										Total = Sum(45)m =		1373.9704 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.3677	18.6883	19.2847	16.8129	16.1323	13.9210	12.8998	14.8027	14.9795	17.4572	19.0559	20.6935 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

Enter (49) or (54) in (55)											0.7527 (55)	
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (58)
Total heat required for water heating calculated for each month	189.0462	166.6746	175.1594	157.1775	154.1438	137.8983	132.5938	145.2799	144.9554	162.9763	172.1312	184.5514 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input	(sum of months) =	Sum(63)m =		0.0000 (63)
Output from w/h	189.0462	166.6746	175.1594	157.1775	154.1438	137.8983	132.5938	145.2799	144.9554	162.9763	172.1312	184.5514 (64)
								Total per year (kWh/year) =	Sum(64)m =			1922.5878 (64)
Heat gains from water heating, kWh/month	84.6410	75.0944	80.0236	73.3420	73.0359	66.9316	65.8705	70.0887	69.2781	75.9727	78.3141	83.1465 (65)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												2794.0229 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	544.7639	404.5482	320.2299	171.2393	68.6082	0.0000	0.0000	0.0000	0.0000	167.7519	371.5944	563.6756 (98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000 (210)
Space heating fuel (main heating system)	582.6352	432.6718	342.4919	183.1436	73.3777	0.0000	0.0000	0.0000	0.0000	179.4138	397.4272	602.8616 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	189.0462	166.6746	175.1594	157.1775	154.1438	137.8983	132.5938	145.2799	144.9554	162.9763	172.1312	184.5514 (64)
Efficiency of water heater (217)m	87.4782	87.0926	86.4036	85.0426	82.8158	79.8000	79.8000	79.8000	79.8000	84.8909	86.8149	79.8000 (216)
Fuel for water heating, kWh/month	216.1067	191.3763	202.7223	184.8220	186.1285	172.8049	166.1576	182.0550	181.6484	191.9833	198.2739	210.6685 (219)
Water heating fuel used												2284.7474 (219)
Annual totals kWh/year												
Space heating fuel - main system												2794.0229 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												312.3672 (232)
Total delivered energy for all uses												5466.1375 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2794.0229	0.2160	603.5089 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2284.7474	0.2160	493.5054 (264)
Space and water heating			1097.0144 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	312.3672	0.5190	162.1186 (268)
Total CO2, kg/m2/year			1298.0580 (272)
Emissions per m2 for space and water heating			15.7572 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3286 (272b)
Emissions per m2 for pumps and fans			0.5591 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.7572 * 1.00) + 2.3286 + 0.5591, rounded to 2 d.p.			18.6400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	049	Issued on Date	29/04/2022
Assessment Reference	049	Prop Type Ref	
Property			
SAP Rating	83 B	DER	18.58
Environmental	86 B	TER	19.92
CO ₂ Emissions (t/year)	1.11	% DER<TER	6.70
General Requirements Compliance	Pass	DFEE	50.85
		TFEE	59.48
		% DFEE<TFEE	14.51
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 19.92 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 18.58 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)59.5 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)50.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.61	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing West:	5.93 m ² , No overhang
Windows facing North West:	7.10 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Exposed floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												75.6500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			13.0300	1.1450	14.9198		(27)
Exposed			72.7700	0.1000	7.2770		(28b)
External Wall	35.0800	13.0300	22.0500	0.1500	3.3075		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Core	18.2300		18.2300	0.2500	4.5575		(29a)
Total net area of external elements Aum(A, m2)			143.5800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		35.8543		(33)
Party Wall 1			18.3000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.4276 (36)
Total fabric heat loss							(33) + (36) = 52.2819 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	17.0688	16.8774	16.6860	15.7292	15.5379	14.5811	14.5811	14.3897	14.9638	15.5379	15.9206	16.3033 (38)
Heat transfer coeff	69.3507	69.1594	68.9680	68.0112	67.8198	66.8630	66.8630	66.6716	67.2457	67.8198	68.2025	68.5853 (39)
Average = Sum(39)m / 12 =												67.9633 (39)
HLP	0.9530	0.9504	0.9478	0.9346	0.9320	0.9188	0.9188	0.9162	0.9241	0.9320	0.9372	0.9425 (40)
HLP (average)												0.9339 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)												Total = Sum(45)m = 1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)
Water storage loss:												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(64)
Heat gains from water heating, kWh/month												
92.5474	82.2081	87.8363	80.8195	80.7069	74.2791	73.3961	77.6998	76.6732	83.7032	85.8924	91.0225	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
18.2451	16.2051	13.1789	9.9773	7.4581	6.2965	6.8035	8.8435	11.8697	15.0713	17.5905	18.7521	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	(71)
Water heating gains (Table 5)												
124.3916	122.3335	118.0596	112.2492	108.4770	103.1654	98.6507	104.4353	106.4905	112.5044	119.2950	122.3421	(72)
Total internal gains												
403.9823	401.9977	389.3716	369.0214	348.4174	328.4923	315.4981	321.2091	331.6165	352.1703	375.7927	393.4532	(73)

6. Solar gains

[Jan]				Area	Solar flux	g		FF			Access	Gains
				m2	Table 6a	Specific data		Specific data			factor	W
					W/m2	or Table 6b		or Table 6c			Table 6d	
West				5.9300	19.6403	0.4000		0.8000			0.7700	25.8277 (80)
Northwest				7.1000	11.2829	0.4000		0.8000			0.7700	17.7649 (81)

Solar gains	43.5926	86.6855	148.3572	228.3479	292.5450	305.5740	288.3795	238.8530	176.1598	104.1431	54.5570	35.7472 (83)
Total gains	447.5749	488.6831	537.7288	597.3693	640.9623	634.0663	603.8776	560.0621	507.7763	456.3135	430.3497	429.2004 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	72.8683	73.0700	73.2727	74.3035	74.5132	75.5795	75.5795	75.7964	75.1493	74.5132	74.0951	73.6816
alpha	5.8579	5.8713	5.8848	5.9536	5.9675	6.0386	6.0386	6.0531	6.0100	5.9675	5.9397	5.9121
util living area	0.9977	0.9955	0.9878	0.9544	0.8495	0.6531	0.4839	0.5410	0.8160	0.9724	0.9950	0.9982 (86)
MIT	20.0474	20.1603	20.3718	20.6604	20.8841	20.9814	20.9973	20.9950	20.9331	20.6484	20.3021	20.0292 (87)
Th 2	20.1227	20.1249	20.1271	20.1382	20.1404	20.1515	20.1515	20.1538	20.1471	20.1404	20.1360	20.1315 (88)
util rest of house	0.9969	0.9941	0.9836	0.9386	0.8039	0.5756	0.3924	0.4450	0.7476	0.9598	0.9930	0.9976 (89)
MIT 2	18.8461	19.0124	19.3207	19.7375	20.0279	20.1393	20.1505	20.1517	20.0938	19.7289	19.2280	18.8261 (90)
Living area fraction									fLA = Living area / (4) =			0.3848 (91)
MIT	19.3083	19.4541	19.7251	20.0926	20.3573	20.4633	20.4763	20.4762	20.4168	20.0827	19.6413	19.2890 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3083	19.4541	19.7251	20.0926	20.3573	20.4633	20.4763	20.4762	20.4168	20.0827	19.6413	19.2890 (93)

8. Space heating requirement

Utilisation	0.9959	0.9926	0.9812	0.9376	0.8164	0.6049	0.4277	0.4821	0.7710	0.9587	0.9915	0.9968 (94)
Useful gains	445.7508	485.0441	527.6147	560.0879	523.2527	383.5432	258.2869	269.9971	391.5001	437.4883	426.7034	427.8161 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
1040.8372	1006.5493	912.1096	761.2231	587.1386	392.0375	259.1844	271.7652	424.7764	643.1149	855.3456	1034.8836	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
442.7443	350.4514	286.0643	144.8174	47.5311	0.0000	0.0000	0.0000	0.0000	152.9862	308.6224	451.6582	(98)
Space heating												2184.8753 (98)
Space heating per m2												(98) / (4) = 30.0244 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	2184.8753	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	2294.1190	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	2052.6825	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2155.3166	(310a)
Electricity used for heat distribution	44.4944	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)		
mechanical ventilation fans (SFP = 0.7625)	169.2357	(330a)
Total electricity for the above, kWh/year	169.2357	(331)
Electricity for lighting (calculated in Appendix L)	322.2135	(332)
Total delivered energy for all uses	4940.8848	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	4971.4364	0.2160	1073.8303 (367)
Electrical energy for heat distribution	44.4944	0.5190	23.0926 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1096.9228 (373)
Space and water heating			1096.9228 (376)
Pumps and fans	169.2357	0.5190	87.8333 (378)
Energy for lighting	322.2135	0.5190	167.2288 (379)
Total CO2, kg/year			1351.9850 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			18.5800 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER	18.5800	ZC1
Total Floor Area	72.7700	TFA
Assumed number of occupants	2.3115	N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	EF
CO2 emissions from appliances, equation (L14)	16.5855	ZC2
CO2 emissions from cooking, equation (L16)	2.3976	ZC3
Total CO2 emissions	37.5631	ZC4
Residual CO2 emissions offset from biofuel CHP	0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year	0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000	ZC7
Net CO2 emissions	37.5631	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1649 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4149 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3527 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4497	0.4408	0.4320	0.3879	0.3791	0.3350	0.3350	0.3262	0.3527	0.3791	0.3968	0.4144 (22b)
Effective ac	0.6011	0.5972	0.5933	0.5752	0.5719	0.5561	0.5561	0.5532	0.5622	0.5719	0.5787	0.5859 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			13.0300	1.3258	17.2746			(27)					
Exposed			72.7700	0.1300	9.4601			(28b)					
External Wall	35.0800	13.0300	22.0500	0.1800	3.9690			(29a)					
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098			(29a)					
Core	18.2300		18.2300	0.1800	3.2814			(29a)					
Total net area of external elements Aum(A, m2)			143.5800					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.6849			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								15.1850 (36)					
Total fabric heat loss						(33) + (36) =	53.8699	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.0868	35.8511	35.6201	34.5351	34.3321	33.3870	33.3870	33.2120	33.7511	34.3321	34.7427	35.1721	(38)
Heat transfer coeff	89.9567	89.7210	89.4900	88.4050	88.2020	87.2570	87.2570	87.0820	87.6210	88.2020	88.6127	89.0420	(39)
Average = Sum(39)m / 12 =												88.4040	(39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2362	1.2329	1.2298	1.2149	1.2121	1.1991	1.1991	1.1967	1.2041	1.2121	1.2177	1.2236	(40)
HLP (average)												1.2148	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)										Total = Sum(45)m =		1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												
21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)	
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (64)
Heat gains from water heating, kWh/month	85.6018	75.9347	80.8908	74.0980	73.7613	67.5576	66.4506	70.7543	69.9517	76.7577	79.1709	84.0770 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5611	16.4858	13.4072	10.1501	7.5873	6.4055	6.9214	8.9967	12.0753	15.3324	17.8952	19.0770	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	(71)
Water heating gains (Table 5)	115.0562	112.9981	108.7242	102.9139	99.1416	93.8300	89.3153	95.0999	97.1551	103.1690	109.9597	113.0067	(72)
Total internal gains	397.9629	395.9430	383.2645	362.8588	342.2112	322.2660	309.2806	315.0269	325.4868	346.0960	369.7620	387.4427	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
West					5.9300	19.6403	0.6300	0.7000			0.7700			35.5938 (80)
Northwest					7.1000	11.2829	0.6300	0.7000			0.7700			24.4823 (81)
Solar gains	60.0761	119.4634	204.4548	314.6920	403.1636	421.1192	397.4230	329.1693	242.7702	143.5223	75.1863			49.2641 (83)
Total gains	458.0390	515.4064	587.7193	677.5508	745.3747	743.3852	706.7036	644.1963	568.2570	489.6183	444.9483			436.7067 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	56.1767	56.3243	56.4697	57.1627	57.2943	57.9148	57.9148	58.0312	57.6742	57.2943	57.0288	56.7538
alpha	4.7451	4.7550	4.7646	4.8108	4.8196	4.8610	4.8610	4.8687	4.8449	4.8196	4.8019	4.7836
util living area	0.9975	0.9952	0.9873	0.9562	0.8653	0.6940	0.5301	0.5970	0.8535	0.9768	0.9952	0.9980 (86)
MIT	19.6717	19.8156	20.0875	20.4619	20.7763	20.9456	20.9881	20.9796	20.8472	20.4397	19.9942	19.6500 (87)
Th 2	19.8912	19.8937	19.8963	19.9081	19.9104	19.9207	19.9207	19.9227	19.9167	19.9104	19.9059	19.9012 (88)
util rest of house	0.9967	0.9935	0.9826	0.9394	0.8160	0.5991	0.4068	0.4694	0.7809	0.9649	0.9932	0.9974 (89)
MIT 2	18.1306	18.3423	18.7386	19.2791	19.6936	19.8854	19.9165	19.9144	19.7934	19.2585	18.6122	18.1058 (90)
Living area fraction	18.7236	18.9092	19.2576	19.7342	20.1102	20.2933	20.3288	20.3243	20.1989	19.7130	19.1440	18.7000 (91)
MIT	18.7236	18.9092	19.2576	19.7342	20.1102	20.2933	20.3288	20.3243	20.1989	19.7130	19.1440	18.7000 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7236	18.9092	19.2576	19.7342	20.1102	20.2933	20.3288	20.3243	20.1989	19.7130	19.1440	18.7000 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	455.9151	510.9945	575.3980	634.2636	615.8056	471.1357	321.2783	334.2255	456.0159	471.0286	441.0377	435.0859	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1297.4966	1256.9165	1141.6806	957.8011	741.7970	496.7810	325.3670	341.7325	534.3878	803.7819	1067.2466	1291.1091	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	626.1367	501.2596	421.3142	232.9470	93.7377	0.0000	0.0000	0.0000	0.0000	247.5684	450.8704	636.8813	(98)
Space heating												3210.7152	(98)
Space heating per m ²												44.1214	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3433.9200 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	626.1367	501.2596	421.3142	232.9470	93.7377	0.0000	0.0000	0.0000	0.0000	247.5684	450.8704	636.8813	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	669.6649	536.1065	450.6034	249.1412	100.2542	0.0000	0.0000	0.0000	0.0000	264.7791	482.2144	681.1564	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500	(64)
Efficiency of water heater (217)m	87.7398	87.5378	87.0370	85.8238	83.5008	79.8000	79.8000	79.8000	79.8000	85.8886	87.2334	87.8233	(216)
Fuel for water heating, kWh/month	218.7559	193.2901	204.2436	185.7890	187.2145	175.1642	168.3438	184.5636	184.1870	192.5020	200.2768	213.3260	(219)
Water heating fuel used												2307.6565	(219)
Annual totals kWh/year													
Space heating fuel - main system												3433.9200	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												327.7949	(232)
Total delivered energy for all uses												6144.3714	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3433.9200	0.2160	741.7267 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2307.6565	0.2160	498.4538 (264)
Space and water heating			1240.1805 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	327.7949	0.5190	170.1255 (268)
Total CO2, kg/m2/year			1449.2311 (272)
Emissions per m2 for space and water heating			17.0425 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3379 (272b)
Emissions per m2 for pumps and fans			0.5349 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.0425 * 1.00) + 2.3379 + 0.5349, rounded to 2 d.p.			19.9200 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	050			Issued on Date	29/04/2022
Assessment Reference	050	Prop Type Ref			
Property					
SAP Rating	83 B	DER	18.96	TER	20.39
Environmental	86 B	% DER<TER	7.00		
CO ₂ Emissions (t/year)	1.12	DFEE	52.38	TFEE	61.68
General Requirements Compliance	Pass	% DFEE<TFEE	15.09		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 20.39 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 18.96 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)61.7 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)52.4 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.61	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing North:	5.88 m ² , No overhang
Windows facing North West:	7.10 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Exposed floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							2	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1275 (21)				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			12.9800	1.1450	14.8626		(27)					
Exposed			72.7700	0.1000	7.2770		(28b)					
External Wall	35.0800	12.9800	22.1000	0.1500	3.3150		(29a)					
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)					
Core	18.2300		18.2300	0.2500	4.5575		(29a)					
Total net area of external elements Aum(A, m2)			143.5800				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		35.8046		(33)					
Party Wall 1			18.3000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								16.4256 (36)				
Total fabric heat loss						(33) + (36) =	52.2302 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 17.0688	Feb 16.8774	Mar 16.6860	Apr 15.7292	May 15.5379	Jun 14.5811	Jul 14.5811	Aug 14.3897	Sep 14.9638	Oct 15.5379	Nov 15.9206	Dec 16.3033 (38)
Heat transfer coeff	69.2990	69.1076	68.9162	67.9594	67.7681	66.8113	66.8113	66.6199	67.1940	67.7681	68.1508	68.5335 (39)
Average = Sum(39)m / 12 =												67.9116 (39)
HLP	Jan 0.9523	Feb 0.9497	Mar 0.9470	Apr 0.9339	May 0.9313	Jun 0.9181	Jul 0.9181	Aug 0.9155	Sep 0.9234	Oct 0.9313	Nov 0.9365	Dec 0.9418 (40)
HLP (average)												0.9332 (40)
Days in month												
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	Jan 98.0067	Feb 94.4428	Mar 90.8789	Apr 87.3151	May 83.7512	Jun 80.1873	Jul 80.1873	Aug 83.7512	Sep 87.3151	Oct 90.8789	Nov 94.4428	Dec 98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)												Total = Sum(45)m = 1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												

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	21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)
Water storage loss:												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(64)
Total per year (kWh/year) = Sum(64)m =												2052.6825 (64)
Heat gains from water heating, kWh/month												
92.5474	82.2081	87.8363	80.8195	80.7069	74.2791	73.3961	77.6998	76.6732	83.7032	85.8924	91.0225	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
18.2514	16.2107	13.1835	9.9807	7.4607	6.2986	6.8059	8.8466	11.8739	15.0766	17.5966	18.7587	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	(71)
Water heating gains (Table 5)												
124.3916	122.3335	118.0596	112.2492	108.4770	103.1654	98.6507	104.4353	106.4905	112.5044	119.2950	122.3421	(72)
Total internal gains												
403.9886	402.0033	389.3762	369.0248	348.4200	328.4945	315.5005	321.2122	331.6207	352.1755	375.7988	393.4597	(73)

6. Solar gains

[Jan]				Area	Solar flux	g		FF	Access		Gains	
				m2	Table 6a	Specific data		Specific data	factor		W	
					W/m2	or Table 6b		or Table 6c	Table 6d			
North				5.8800	10.6334	0.4000		0.8000	0.7700		13.8654 (74)	
Northwest				7.1000	11.2829	0.4000		0.8000	0.7700		17.7649 (81)	

Solar gains	31.6303	62.6585	110.1764	179.3190	241.2494	257.6284	240.8129	191.6050	133.5227	75.7335	39.4577	26.0666 (83)
Total gains	435.6190	464.6619	499.5526	548.3439	589.6693	586.1229	556.3134	512.8172	465.1433	427.9090	415.2565	419.5263 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	72.9228	73.1247	73.3277	74.3601	74.5701	75.6380	75.6380	75.8553	75.2072	74.5701	74.1513	73.7372
alpha	5.8615	5.8750	5.8885	5.9573	5.9713	6.0425	6.0425	6.0570	6.0138	5.9713	5.9434	5.9158
util living area	0.9980	0.9965	0.9915	0.9683	0.8834	0.6966	0.5231	0.5867	0.8560	0.9794	0.9958	0.9984 (86)
MIT	20.0326	20.1299	20.3246	20.6086	20.8531	20.9740	20.9960	20.9924	20.9119	20.6160	20.2832	20.0174 (87)
Th 2	20.1233	20.1255	20.1277	20.1388	20.1410	20.1521	20.1521	20.1544	20.1477	20.1410	20.1366	20.1321 (88)
util rest of house	0.9973	0.9954	0.9885	0.9565	0.8432	0.6176	0.4252	0.4845	0.7936	0.9695	0.9942	0.9978 (89)
MIT 2	18.8250	18.9686	19.2535	19.6679	19.9937	20.1345	20.1506	20.1511	20.0743	19.6849	19.2012	18.8093 (90)
Living area fraction												
MIT	19.2897	19.4155	19.6656	20.0299	20.3244	20.4575	20.4759	20.4748	20.3966	20.0431	19.6175	19.2741 (91)
Temperature adjustment												
adjusted MIT	19.2897	19.4155	19.6656	20.0299	20.3244	20.4575	20.4759	20.4748	20.3966	20.0431	19.6175	19.2741 (92)
												0.0000
												19.2741 (93)

8. Space heating requirement

Utilisation	0.9964	0.9941	0.9864	0.9547	0.8527	0.6472	0.4630	0.5240	0.8138	0.9681	0.9928	0.9971 (94)
Useful gains	434.0633	461.9354	492.7572	523.4959	502.8264	379.3220	257.5823	268.7215	378.5326	414.2641	412.2833	418.3185 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
1038.7686	1003.1294	907.3265	756.3792	584.4581	391.3476	258.9514	271.4633	423.0920	639.9427	853.0788	1033.0843	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
449.9007	363.6823	308.4395	167.6760	60.7340	0.0000	0.0000	0.0000	0.0000	167.9049	317.3728	457.3858	(98)
Space heating												2293.0961 (98)
Space heating per m2												(98) / (4) = 31.5116 (99)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	2293.0961	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	2407.7509	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating:		
Annual water heating requirement	2052.6825	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2155.3166	(310a)
Electricity used for heat distribution	45.6307	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)		
mechanical ventilation fans (SFP = 0.7625)	169.2357	(330a)
Total electricity for the above, kWh/year	169.2357	(331)
Electricity for lighting (calculated in Appendix L)	322.3254	(332)
Total delivered energy for all uses	5054.6286	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	5098.3994	0.2160	1101.2543 (367)
Electrical energy for heat distribution	45.6307	0.5190	23.6823 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1124.9366 (373)
Space and water heating			1124.9366 (376)
Pumps and fans	169.2357	0.5190	87.8333 (378)
Energy for lighting	322.3254	0.5190	167.2869 (379)
Total CO2, kg/year			1380.0568 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			18.9600 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		18.9600	ZC1
Total Floor Area	TFA	72.7700	
Assumed number of occupants	N	2.3115	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.5855	ZC2
CO2 emissions from cooking, equation (L16)		2.3976	ZC3
Total CO2 emissions		37.9431	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		37.9431	ZC8

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1649 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4149 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3527 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4497	0.4408	0.4320	0.3879	0.3791	0.3350	0.3350	0.3262	0.3527	0.3791	0.3968	0.4144 (22b)
Effective ac	0.6011	0.5972	0.5933	0.5752	0.5719	0.5561	0.5561	0.5532	0.5622	0.5719	0.5787	0.5859 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			12.9800	1.3258	17.2083			(27)					
Exposed			72.7700	0.1300	9.4601			(28b)					
External Wall	35.0800	12.9800	22.1000	0.1800	3.9780			(29a)					
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098			(29a)					
Core	18.2300		18.2300	0.1800	3.2814			(29a)					
Total net area of external elements Aum(A, m2)			143.5800					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.6276			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								15.1830 (36)					
Total fabric heat loss						(33) + (36) =		53.8106 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 36.0868	Feb 35.8511	Mar 35.6201	Apr 34.5351	May 34.3321	Jun 33.3870	Jul 33.3870	Aug 33.2120	Sep 33.7511	Oct 34.3321	Nov 34.7427	Dec 35.1721	(38)
Heat transfer coeff	89.8974	89.6617	89.4307	88.3457	88.1427	87.1977	87.1977	87.0227	87.5617	88.1427	88.5534	88.9827	(39)
Average = Sum(39)m / 12 =												88.3447	(39)
HLP	Jan 1.2354	Feb 1.2321	Mar 1.2290	Apr 1.2140	May 1.2113	Jun 1.1983	Jul 1.1983	Aug 1.1959	Sep 1.2033	Oct 1.2113	Nov 1.2169	Dec 1.2228	(40)
HLP (average)												1.2140	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)										Total = Sum(45)m =		1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												
21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)	
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (64)
Heat gains from water heating, kWh/month	85.6018	75.9347	80.8908	74.0980	73.7613	67.5576	66.4506	70.7543	69.9517	76.7577	79.1709	84.0770 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5727	16.4961	13.4155	10.1564	7.5920	6.4095	6.9257	9.0023	12.0829	15.3420	17.9064	19.0889	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	(71)
Water heating gains (Table 5)	115.0562	112.9981	108.7242	102.9139	99.1416	93.8300	89.3153	95.0999	97.1551	103.1690	109.9597	113.0067	(72)
Total internal gains	397.9745	395.9533	383.2729	362.8651	342.2159	322.2700	309.2849	315.0325	325.4943	346.1056	369.7732	387.4546	(73)

6. Solar gains

[Jan]					Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
North					5.8800	10.6334	0.6300	0.7000			0.7700	19.1083
Northwest					7.1000	11.2829	0.6300	0.7000			0.7700	24.4823
Solar gains	43.5906	86.3513	151.8369	247.1241	332.4718	355.0441	331.8703	264.0557	184.0109	104.3702	54.3776	35.9231
Total gains	441.5651	482.3046	535.1098	609.9892	674.6877	677.3141	641.1552	579.0882	509.5053	450.4758	424.1508	423.3777

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	56.2138	56.3615	56.5071	57.2011	57.3329	57.9542	57.9542	58.0708	57.7133	57.3329	57.0670	56.7916
alpha	4.7476	4.7574	4.7671	4.8134	4.8222	4.8636	4.8636	4.8714	4.8476	4.8222	4.8045	4.7861
util living area	0.9979	0.9964	0.9913	0.9700	0.8980	0.7406	0.5776	0.6514	0.8913	0.9832	0.9961	0.9983 (86)
MIT	19.6521	19.7755	20.0251	20.3911	20.7270	20.9278	20.9829	20.9704	20.8082	20.3953	19.9692	19.6343 (87)
Th 2	19.8918	19.8944	19.8969	19.9088	19.9110	19.9214	19.9214	19.9233	19.9174	19.9110	19.9065	19.9018 (88)
util rest of house	0.9972	0.9951	0.9880	0.9577	0.8560	0.6466	0.4465	0.5179	0.8289	0.9742	0.9944	0.9977 (89)
MIT 2	18.1024	18.2844	18.6495	19.1831	19.6376	19.8726	19.9151	19.9108	19.7544	19.1972	18.5763	18.0833 (90)
Living area fraction	18.6987	18.8581	19.1788	19.6479	20.0568	20.2786	20.3260	20.3185	20.1599	19.6582	19.1123	18.6801 (92)
Temperature adjustment	18.6987	18.8581	19.1788	19.6479	20.0568	20.2786	20.3260	20.3185	20.1599	19.6582	19.1123	18.6801 (93)
adjusted MIT	18.6987	18.8581	19.1788	19.6479	20.0568	20.2786	20.3260	20.3185	20.1599	19.6582	19.1123	18.6801 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	439.7982	479.1159	527.1258	581.9274	581.8938	460.6378	318.9100	329.8776	430.7179	437.5887	421.0590	421.9939	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1294.4055	1251.5092	1133.8736	949.5328	736.5912	495.1600	324.8961	341.0002	530.6128	798.4137	1063.7290	1288.4776	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	635.8278	519.0482	451.4203	264.6759	115.0948	0.0000	0.0000	0.0000	0.0000	268.4538	462.7223	644.6638	(98)
Space heating												3361.9071	(98)
Space heating per m ²												46.1991	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3595.6226 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	635.8278	519.0482	451.4203	264.6759	115.0948	0.0000	0.0000	0.0000	0.0000	268.4538	462.7223	644.6638	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	680.0298	555.1318	482.8025	283.0758	123.0961	0.0000	0.0000	0.0000	0.0000	287.1163	494.8902	689.4800	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500	(64)
Efficiency of water heater (217)m	87.7711	87.6120	87.1967	86.1569	84.0120	79.8000	79.8000	79.8000	79.8000	86.0998	87.2920	87.8476	(216)
Fuel for water heating, kWh/month	218.6778	193.1266	203.8696	185.0709	186.0752	175.1642	168.3438	184.5636	184.1870	192.0297	200.1424	213.2670	(219)
Water heating fuel used												2304.5178	(219)
Annual totals kWh/year													
Space heating fuel - main system													3595.6226 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													75.0000 (231)
Electricity for lighting (calculated in Appendix L)													327.9999 (232)
Total delivered energy for all uses													6303.1402 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3595.6226	0.2160	776.6545 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2304.5178	0.2160	497.7758 (264)
Space and water heating			1274.4303 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	327.9999	0.5190	170.2319 (268)
Total CO2, kg/m2/year			1483.5872 (272)
Emissions per m2 for space and water heating			17.5131 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3393 (272b)
Emissions per m2 for pumps and fans			0.5349 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.5131 * 1.00) + 2.3393 + 0.5349, rounded to 2 d.p.			20.3900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	051	Issued on Date	29/04/2022
Assessment Reference	051	Prop Type Ref	
Property			
SAP Rating	83 B	DER	17.59
Environmental	87 B	TER	19.04
CO ₂ Emissions (t/year)	1.07	% DER<TER	7.61
General Requirements Compliance	Fail	DFEE	47.14
		TFEE	55.88
		% DFEE<TFEE	15.64
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 74 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 19.04 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.59 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)55.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)47.1 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing North: 1.97 m², No overhang
Windows facing North East: 9.35 m², No overhang
Windows facing East: 2.21 m², No overhang
Windows facing South East: 6.24 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Exposed floor U-value 0.10 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												75.6500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			1.8900	1.0000	1.8900		(26)	
Window (Uw = 1.20)			19.7700	1.1450	22.6374		(27)	
Exposed			73.5200	0.1000	7.3520		(28b)	
External Wall	49.6500	19.7700	29.8800	0.1500	4.4820		(29a)	
Corridor	5.4000	1.8900	3.5100	0.2500	0.8775		(29a)	
Total net area of external elements Aum(A, m2)			128.5700				(31)	
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		37.2389		(33)	
Party Wall 1			38.0500	0.0000	0.0000		(32)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								16.1586 (36)
Total fabric heat loss								(33) + (36) = 53.3975 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	17.2447	17.0514	16.8580	15.8913	15.6980	14.7313	14.7313	14.5380	15.1180	15.6980	16.0847	16.4714 (38)
Average = Sum(39)m / 12 =	70.6422	70.4489	70.2555	69.2889	69.0955	68.1288	68.1288	67.9355	68.5155	69.0955	69.4822	69.8689 (39)
												69.2405 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9609	0.9582	0.9556	0.9424	0.9398	0.9267	0.9267	0.9240	0.9319	0.9398	0.9451	0.9503 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3285 (42)
Average daily hot water use (litres/day)													89.5010 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)	
Energy conte	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)	
Energy content (annual)												Total = Sum(45)m = 1408.1991 (45)	
Distribution loss (46)m = 0.15 x (45)m	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)	

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	201.2769	177.6201	187.0442	168.3717	165.5050	148.6122	143.4181	156.4202	155.8451	174.5575	183.6979	196.6701	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
	Solar input (sum of months) = Sum (63)m =											0.0000 (63)	
Output from w/h													
	201.2769	177.6201	187.0442	168.3717	165.5050	148.6122	143.4181	156.4202	155.8451	174.5575	183.6979	196.6701	(64)
	Total per year (kWh/year) = Sum (64)m =											2059.0388 (64)	
Heat gains from water heating, kWh/month													
	92.7665	82.3997	88.0341	80.9919	80.8723	74.4219	73.5284	77.8516	76.8268	83.8823	86.0878	91.2347	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3088	16.2617	13.2249	10.0121	7.4842	6.3185	6.8273	8.8744	11.9112	15.1240	17.6520	18.8177 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385 (71)
Water heating gains (Table 5)	124.6861	122.6187	118.3254	112.4887	108.6993	103.3637	98.8285	104.6393	106.7039	112.7450	119.5664	122.6273 (72)
Total internal gains	406.2912	404.3077	391.6074	371.1252	350.3761	330.3110	317.2233	322.9500	333.4217	354.1083	377.8894	395.6798 (73)

[Jan	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	1.9700	10.6334	0.4000	0.8000	0.7700	4.6454 (74)
Northeast	9.3500	11.2829	0.4000	0.8000	0.7700	23.3947 (75)
East	2.2100	19.6403	0.4000	0.8000	0.7700	9.6255 (76)
Southeast	6.2400	36.7938	0.4000	0.8000	0.7700	50.9147 (77)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	72.2735	72.4718	72.6712	73.6851	73.8913	74.9397	74.9397	75.1530	74.5168	73.8913	73.4801	73.0734
alpha	5.8182	5.8315	5.8447	5.9123	5.9261	5.9960	5.9960	6.0102	5.9678	5.9261	5.8987	5.8716
util living area	0.9963	0.9912	0.9740	0.9081	0.7530	0.5465	0.3985	0.4506	0.7196	0.9465	0.9913	0.9972 (86)
MIT	20.0915	20.2417	20.4792	20.7652	20.9392	20.9924	20.9990	20.9980	20.9653	20.7258	20.3578	20.0655 (87)
Th 2	20.1161	20.1183	20.1205	20.1316	20.1338	20.1449	20.1449	20.1471	20.1404	20.1338	20.1294	20.1249 (88)
util rest of house	0.9951	0.9884	0.9658	0.8820	0.6996	0.4767	0.3216	0.3682	0.6458	0.9252	0.9880	0.9963 (89)
MIT 2	18.9053	19.1251	19.4674	19.8677	20.0787	20.1402	20.1445	20.1463	20.1150	19.8261	19.3032	18.8741 (90)
Living area fraction	19.3416	19.5358	19.8395	20.1978	20.3952	20.4536	20.4588	20.4596	20.4277	20.1570	19.6911	19.3123 (91)
MIT	19.3416	19.5358	19.8395	20.1978	20.3952	20.4536	20.4588	20.4596	20.4277	20.1570	19.6911	19.3123 (92)
Temperature adjustment	19.3416	19.5358	19.8395	20.1978	20.3952	20.4536	20.4588	20.4596	20.4277	20.1570	19.6911	0.0000
adjusted MIT	19.3416	19.5358	19.8395	20.1978	20.3952	20.4536	20.4588	20.4596	20.4277	20.1570	19.6911	19.3123 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9937	0.9861	0.9626	0.8842	0.7164	0.5022	0.3499	0.3986	0.6716	0.9259	0.9859	0.9952 (94)
Useful gains	491.7542	558.4737	618.1710	644.1502	567.7955	395.4399	262.5786	275.1216	416.8125	500.9617	479.1818	467.8817 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1062.5710	1031.0749	937.1761	782.8126	600.7986	398.7998	262.8960	275.7900	433.5470	660.3464	874.8538	1055.8767 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	424.6877	317.5881	237.3398	99.8369	24.5543	0.0000	0.0000	0.0000	0.0000	118.5822	284.8838	437.4683 (98)
Space heating												1944.9411 (98)
Space heating per m2												26.4546 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1944.9411 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	2042.1882 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2059.0388 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2161.9908 (310a)
Electricity used for heat distribution	42.0418 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	170.9800 (330a)
Total electricity for the above, kWh/year	170.9800 (331)
Electricity for lighting (calculated in Appendix L)	323.3395 (332)
Total delivered energy for all uses	4698.4984 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	4697.4066	0.2160	1014.6398 (367)
Electrical energy for heat distribution	42.0418	0.5190	21.8197 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1036.4595 (373)
Space and water heating			1036.4595 (376)
Pumps and fans	170.9800	0.5190	88.7386 (378)
Energy for lighting	323.3395	0.5190	167.8132 (379)
Total CO2, kg/year			1293.0113 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			17.5900 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER	17.5900 ZC1
Total Floor Area	TFA 73.5200
Assumed number of occupants	N 2.3285
CO2 emission factor in Table 12 for electricity displaced from grid	EF 0.5190
CO2 emissions from appliances, equation (L14)	16.5530 ZC2
CO2 emissions from cooking, equation (L16)	2.3787 ZC3
Total CO2 emissions	36.5217 ZC4
Residual CO2 emissions offset from biofuel CHP	0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year	0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000 ZC7
Net CO2 emissions	36.5217 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1632 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4132 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3512 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4478	0.4390	0.4303	0.3864	0.3776	0.3337	0.3337	0.3249	0.3512	0.3776	0.3951	0.4127 (22b)
	0.6003	0.5964	0.5926	0.5746	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			16.4900	1.3258	21.8617		(27)
Exposed			73.5200	0.1300	9.5576		(28b)
External Wall	49.6500	16.4900	33.1600	0.1800	5.9688		(29a)
Corridor	5.4000	1.8900	3.5100	0.1800	0.6318		(29a)
Total net area of external elements Aum(A, m ²)			128.5700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.9099		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.7440 (36)
Total fabric heat loss						(33) + (36) =	54.6539 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.4091	36.1729	35.9414	34.8541	34.6506	33.7036	33.7036	33.5282	34.0684	34.6506	35.0622	35.4924 (38)
Heat transfer coeff	91.0630	90.8268	90.5954	89.5080	89.3046	88.3575	88.3575	88.1822	88.7223	89.3046	89.7161	90.1464 (39)
Average = Sum(39)m / 12 =												89.5070 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2386	1.2354	1.2323	1.2175	1.2147	1.2018	1.2018	1.1994	1.2068	1.2147	1.2203	1.2261 (40)
HLP (average)												1.2175 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy content (annual)	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1408.1991 (45)
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
Heat gains from water heating, kWh/month	85.8210	76.1264	81.0886	74.2704	73.9268	67.7004	66.5829	70.9061	70.1053	76.9367	79.3664	84.2892 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231 (66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3070	16.2601	13.2236	10.0111	7.4834	6.3178	6.8266	8.8735	11.9100	15.1225	17.6502	18.8158 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423 (69)	
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)	
Losses e.g. evaporation (negative values) (Table 5)	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385 (71)	
Water heating gains (Table 5)	115.3508	113.2833	108.9900	103.1533	99.3640	94.0283	89.4931	95.3039	97.3685	103.4096	110.2311	113.2919 (72)	
Total internal gains	399.9539	397.9707	385.2706	364.7888	344.0400	323.9750	310.8872	316.6137	327.0851	347.7714	371.5522	389.3425 (73)	

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				1.6400	10.6334	0.6300	0.7000	0.7700	5.3295 (74)			
Northeast				7.8000	11.2829	0.6300	0.7000	0.7700	26.8961 (75)			
East				1.8400	19.6403	0.6300	0.7000	0.7700	11.0443 (76)			
Southeast				5.2100	36.7938	0.6300	0.7000	0.7700	58.5847 (77)			
Solar gains	101.8546	186.3291	288.0641	410.8612	508.2861	525.4572	497.9438	422.2753	330.2245	214.9569	124.3588	85.6262 (83)
Total gains	501.8085	584.2998	673.3347	775.6500	852.3261	849.4322	808.8310	738.8890	657.3096	562.7283	495.9110	474.9687 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.0662	56.2120	56.3556	57.0402	57.1701	57.7829	57.7829	57.8978	57.5453	57.1701	56.9079	56.6363	
alpha	4.7377	4.7475	4.7570	4.8027	4.8113	4.8522	4.8522	4.8599	4.8364	4.8113	4.7939	4.7758	
util living area	0.9965	0.9923	0.9793	0.9333	0.8170	0.6317	0.4734	0.5351	0.7979	0.9626	0.9927	0.9973 (86)	
MIT	19.7168	19.8899	20.1766	20.5468	20.8306	20.9634	20.9926	20.9871	20.8891	20.5113	20.0481	19.6887 (87)	
Th 2	19.8892	19.8918	19.8943	19.9061	19.9083	19.9185	19.9185	19.9205	19.9146	19.9083	19.9038	19.8991 (88)	
util rest of house	0.9953	0.9896	0.9720	0.9101	0.7602	0.5388	0.3608	0.4165	0.7157	0.9449	0.9898	0.9964 (89)	
MIT 2	18.1950	18.4485	18.8639	19.3900	19.7509	19.8958	19.9160	19.9155	19.8304	19.3543	18.6885	18.1608 (90)	
Living area fraction									fLA = Living area / (4) =			0.3678 (91)	
MIT	18.7547	18.9786	19.3467	19.8154	20.1480	20.2885	20.3120	20.3096	20.2198	19.7798	19.1885	18.7228 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.7547	18.9786	19.3467	19.8154	20.1480	20.2885	20.3120	20.3096	20.2198	19.7798	19.1885	18.7228 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9936	0.9867	0.9674	0.9078	0.7739	0.5719	0.4025	0.4604	0.7412	0.9422	0.9871	0.9950 (94)	
Useful gains	498.5759	576.5100	651.3861	704.1493	659.5782	485.7510	325.5256	340.1792	487.2066	530.2076	489.5205	472.5739 (95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W	1316.2904	1278.7172	1163.8527	977.0197	754.4457	502.6191	327.9809	344.7571	542.9634	819.8004	1084.5373	1309.1752 (97)	
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)	
Space heating kWh	608.3796	471.8833	381.2751	196.4666	70.5814	0.0000	0.0000	0.0000	0.0000	215.4570	428.4122	622.4314 (98)	
Space heating												2994.8866 (98)	
Space heating per m2										(98) / (4) =		40.7357 (99)	

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												3203.0873 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	608.3796	471.8833	381.2751	196.4666	70.5814	0.0000	0.0000	0.0000	0.0000	215.4570	428.4122	622.4314 (98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000 (210)
Space heating fuel (main heating system)	650.6734	504.6880	407.7809	210.1247	75.4882	0.0000	0.0000	0.0000	0.0000	230.4353	458.1948	665.7020 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
Efficiency of water heater (217)m	87.6733	87.3993	86.7910	85.3630	82.8400	79.8000	79.8000	79.8000	79.8000	85.5124	87.1085	79.8000 (216)
Fuel for water heating, kWh/month	219.6734	194.2560	205.5077	187.3994	189.3085	175.7022	168.8423	185.1357	184.7660	193.9783	201.2386	214.1826 (219)
Water heating fuel used												2319.9908 (219)
Annual totals kWh/year												
Space heating fuel - main system												3203.0873 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												323.3067 (232)
Total delivered energy for all uses												5921.3849 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3203.0873	0.2160	691.8669 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2319.9908	0.2160	501.1180 (264)
Space and water heating			1192.9849 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	323.3067	0.5190	167.7962 (268)
Total CO2, kg/m2/year			1399.7061 (272)
Emissions per m2 for space and water heating			16.2267 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2823 (272b)
Emissions per m2 for pumps and fans			0.5294 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.2267 * 1.00) + 2.2823 + 0.5294, rounded to 2 d.p.			19.0400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	052			Issued on Date	29/04/2022
Assessment Reference	052	Prop Type Ref			
Property					
SAP Rating	83 B	DER	17.78	TER	19.72
Environmental	89 B	% DER<TER	9.85		
CO ₂ Emissions (t/year)	0.77	DFEE	40.28	TFEE	46.63
General Requirements Compliance	Pass	% DFEE<TFEE	13.62		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 19.72 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 17.78 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)46.6 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)40.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.15 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing South East:	3.69 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Exposed floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					0.0000 / (5) = 0.0000 (8)
Measured/design AP50					Yes
Infiltration rate					3.0000
Number of sides sheltered					0.1500 (18)
					3 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			5.9000	1.1450	6.7557		(27)
Exposed			50.7900	0.1000	5.0790		(28b)
External Wall	19.8500	5.9000	13.9500	0.1500	2.0925		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Total net area of external elements Aum(A, m ²)			88.1400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.7197		(33)
Party Wall 1			37.0000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.4658 (36)
Total fabric heat loss						(33) + (36) =	30.1855 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	11.1341	11.0123	10.8905	10.2816	10.1599	9.5510	9.5510	9.4292	9.7945	10.1599	10.4034	10.6470 (38)
Average = Sum(39)m / 12 =	41.3196	41.1978	41.0761	40.4672	40.3454	39.7365	39.7365	39.6147	39.9801	40.3454	40.5889	40.8325 (39)
												40.4367 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8135	0.8111	0.8087	0.7968	0.7944	0.7824	0.7824	0.7800	0.7872	0.7944	0.7992	0.8039 (40)
Days in month												0.7962 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy content (annual)	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1178.3544 (45)
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)

Water storage loss:													
Store volume								110.0000 (47)					
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)								0.0152 (51)					
Volume factor from Table 2a								1.0294 (52)					
Temperature factor from Table 2b								0.6000 (53)					
Enter (49) or (54) in (55)								1.0327 (55)					
Total storage loss													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817								32.0144 (56)					
If cylinder contains dedicated solar storage													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817								32.0144 (57)					
Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120								23.2624 (59)					
Total heat required for water heating calculated for each month													
Solar input 177.4469 156.7782 165.5372 149.6214 147.5136 133.0871 129.0318 139.9117 139.1394 155.0886 162.4461								173.5921 (62)					
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000								0.0000 (63)					
								Solar input (sum of months) = Sum(63)m = 0.0000 (63)					
Output from w/h													
177.4469 156.7782 165.5372 149.6214 147.5136 133.0871 129.0318 139.9117 139.1394 155.0886 162.4461								173.5921 (64)					
								Total per year (kWh/year) = Sum(64)m = 1829.1942 (64)					
Heat gains from water heating, kWh/month													
84.8430 75.4698 80.8830 74.7574 74.8902 69.2597 68.7450 72.3625 71.2721 77.4089 79.0216								83.5613 (65)					

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.4453	12.8302	10.4342	7.8994	5.9049	4.9851	5.3866	7.0017	9.3977	11.9326	13.9271	14.8468 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	114.0363	112.3063	108.7138	103.8297	100.6589	96.1941	92.3992	97.2615	98.9891	104.0442	109.7522	112.3135 (72)
Total internal gains	326.4678	324.6718	314.7796	299.0502	283.3942	268.1500	258.1697	263.0980	271.1253	287.0258	305.2190	318.5597 (73)

[Jan				Area	Solar flux	g	FF	Access	Gains			
				m2	Table 6a	or Table 6b	Specific data	factor	W			
					W/m2		or Table 6c	Table 6d				
Southeast				3.6900	36.7938	0.4000	0.8000	0.7700	30.1082 (77)			
South				2.2100	46.7521	0.4000	0.8000	0.7700	22.9127 (78)			
Solar gains	53.0209	88.8105	117.9712	140.9699	153.6829	150.8599	146.1469	136.8299	125.9133	97.1556	63.2220	45.5650 (83)
Total gains	379.4887	413.4823	432.7508	440.0200	437.0771	419.0099	404.3165	399.9279	397.0386	384.1814	368.4410	364.1247 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	85.3610	85.6133	85.8671	87.1591	87.4222	88.7618	88.7618	89.0346	88.2211	87.4222	86.8976	86.3793
alpha	6.6907	6.7076	6.7245	6.8106	6.8281	6.9175	6.9175	6.9356	6.8814	6.8281	6.7932	6.7586
util living area	0.9917	0.9838	0.9651	0.9135	0.7970	0.5992	0.4317	0.4546	0.6765	0.9073	0.9801	0.9935 (86)
MIT	20.3821	20.4945	20.6492	20.8267	20.9469	20.9936	20.9994	20.9992	20.9856	20.8596	20.5988	20.3601 (87)
Th 2	20.2416	20.2437	20.2458	20.2561	20.2582	20.2686	20.2686	20.2707	20.2645	20.2582	20.2541	20.2499 (88)
util rest of house	0.9893	0.9791	0.9552	0.8901	0.7506	0.5342	0.3604	0.3831	0.6117	0.8784	0.9736	0.9915 (89)
MIT 2	19.4243	19.5877	19.8090	20.0596	20.2084	20.2645	20.2684	20.2704	20.2540	20.1070	19.7472	19.3992 (90)
Living area fraction	19.9055	20.0433	20.2311	20.4451	20.5794	20.6308	20.6357	20.6366	20.6216	20.4851	20.1751	19.8820 (91)
MIT	19.9055	20.0433	20.2311	20.4451	20.5794	20.6308	20.6357	20.6366	20.6216	20.4851	20.1751	19.8820 (92)
Temperature adjustment	19.9055	20.0433	20.2311	20.4451	20.5794	20.6308	20.6357	20.6366	20.6216	20.4851	20.1751	19.8820 (93)
adjusted MIT	19.9055	20.0433	20.2311	20.4451	20.5794	20.6308	20.6357	20.6366	20.6216	20.4851	20.1751	19.8820 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9879	0.9777	0.9550	0.8965	0.7715	0.5667	0.3962	0.4191	0.6437	0.8880	0.9728	0.9904 (94)
Useful gains	374.9123	404.2611	413.2754	394.4932	337.1911	237.4681	160.2034	167.5937	255.5918	341.1379	358.4143	360.6201 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	644.8145	623.8716	564.0209	467.1957	358.2444	239.6446	160.3648	167.8300	260.7344	398.8196	530.7051	640.3362 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	200.8072	147.5783	112.1546	52.3458	15.6636	0.0000	0.0000	0.0000	0.0000	42.9152	124.0494	208.1088 (98)
Space heating												903.6229 (98)
Space heating per m2										(98) / (4) =		17.7914 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	903.6229 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	948.8040 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1920.6539 (310a)
Electricity used for heat distribution	28.6946 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	255.1086 (332)
Total delivered energy for all uses	3246.5577 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3206.0982	0.2160	692.5172 (367)
Electrical energy for heat distribution	28.6946	0.5190	14.8925 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			707.4097 (373)
Space and water heating			707.4097 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	255.1086	0.5190	132.4013 (379)
Total CO2, kg/year			903.1245 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			17.7800 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		17.7800 ZC1
Total Floor Area	TFA	50.7900
Assumed number of occupants	N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.4175 ZC2
CO2 emissions from cooking, equation (L16)		3.1526 ZC3
Total CO2 emissions		38.3501 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		38.3501 ZC8

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					20.0000 / (5) = 0.1575 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4075 (18)
					3 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			5.9000	1.3258	7.8220		(27)
Exposed			50.7900	0.1300	6.6027		(28b)
External Wall	19.8500	5.9000	13.9500	0.1800	2.5110		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Total net area of external elements Aum(A, m ²)			88.1400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.6355		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.7556 (36)
Total fabric heat loss						(33) + (36) =	31.3911 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	24.3480	24.2160	24.0867	23.4794	23.3658	22.8368	22.8368	22.7389	23.0406	23.3658	23.5957	23.8360 (38)
Heat transfer coeff	55.7390	55.6071	55.4778	54.8705	54.7569	54.2279	54.2279	54.1299	54.4316	54.7569	54.9867	55.2270 (39)
Average = Sum(39)m / 12 =												54.8699 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0974	1.0948	1.0923	1.0803	1.0781	1.0677	1.0677	1.0658	1.0717	1.0781	1.0826	1.0874 (40)
HLP (average)												1.0803 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
Heat gains from water heating, kWh/month	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.8788	13.2152	10.7473	8.1364	6.0821	5.1347	5.5483	7.2119	9.6797	12.2907	14.3450	15.2923 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782 (72)
Total internal gains	320.5660	318.7215	308.7573	292.9518	277.2360	261.9642	251.9959	256.9727	265.0719	281.0485	299.3015	312.6698 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Southeast				3.6900	36.7938	0.6300	0.7000	0.7700	41.4928 (77)			
South				2.2100	46.7521	0.6300	0.7000	0.7700	31.5766 (78)			
Solar gains	73.0694	122.3919	162.5791	194.2741	211.7943	207.9038	201.4086	188.5686	173.5243	133.8926	87.1279	62.7943 (83)
Total gains	393.6354	441.1134	471.3364	487.2260	489.0303	469.8680	453.4046	445.5414	438.5962	414.9411	386.4294	375.4641 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	63.2785	63.4286	63.5765	64.2802	64.4135	65.0419	65.0419	65.1596	64.7984	64.4135	64.1443	63.8651
alpha	5.2186	5.2286	5.2384	5.2853	5.2942	5.3361	5.3361	5.3440	5.3199	5.2942	5.2763	5.2577
util living area	0.9935	0.9873	0.9739	0.9395	0.8576	0.6937	0.5180	0.5476	0.7700	0.9412	0.9863	0.9949 (86)
MIT	19.9923	20.1412	20.3545	20.6138	20.8317	20.9604	20.9930	20.9906	20.9290	20.6648	20.2826	19.9633 (87)
Th 2	20.0029	20.0050	20.0071	20.0169	20.0188	20.0273	20.0273	20.0289	20.0240	20.0188	20.0150	20.0112 (88)
util rest of house	0.9914	0.9833	0.9654	0.9189	0.8098	0.6060	0.4078	0.4378	0.6910	0.9171	0.9812	0.9932 (89)
MIT 2	18.6767	18.8938	19.2015	19.5717	19.8555	20.0010	20.0247	20.0251	19.9707	19.6477	19.1075	18.6406 (90)
Living area fraction									fLA = Living area / (4) =			0.5025 (91)
MIT	19.3377	19.5206	19.7809	20.0954	20.3460	20.4831	20.5112	20.5102	20.4522	20.1588	19.6980	19.3052 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3377	19.5206	19.7809	20.0954	20.3460	20.4831	20.5112	20.5102	20.4522	20.1588	19.6980	19.3052 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9896	0.9809	0.9630	0.9208	0.8272	0.6488	0.4634	0.4932	0.7278	0.9211	0.9791	0.9917 (94)
Useful gains	389.5554	432.6763	453.9078	448.6194	404.5154	304.8304	210.1230	219.7273	319.2029	382.2031	378.3672	372.3386 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	838.1883	813.0088	736.7939	614.2945	473.4286	319.0265	212.0977	222.4846	345.7620	523.4075	692.7207	834.2151 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	333.7829	255.5834	210.4673	119.2861	51.2714	0.0000	0.0000	0.0000	0.0000	105.0561	226.3345	343.6362 (98)
Space heating												1645.4179 (98)
Space heating per m2										(98) / (4) =		32.3965 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1759.8052 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	333.7829	255.5834	210.4673	119.2861	51.2714	0.0000	0.0000	0.0000	0.0000	105.0561	226.3345	343.6362	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	356.9871	273.3513	225.0987	127.5787	54.8357	0.0000	0.0000	0.0000	0.0000	112.3595	242.0690	367.5253	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	86.6005	86.2424	85.5988	84.3675	82.4284	79.8000	79.8000	79.8000	79.8000	83.9465	85.8388	79.8000	(216)
Fuel for water heating, kWh/month	194.8776	172.6952	183.2447	167.3861	168.4270	156.2471	150.8144	164.4484	163.8315	174.4047	179.4575	190.1443	(219)
Water heating fuel used												2065.9786	(219)
Annual totals kWh/year													
Space heating fuel - main system												1759.8052	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												262.7644	(232)
Total delivered energy for all uses												4163.5482	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1759.8052	0.2160	380.1179 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2065.9786	0.2160	446.2514 (264)
Space and water heating			826.3693 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	262.7644	0.5190	136.3747 (268)
Total CO2, kg/m2/year			1001.6690 (272)
Emissions per m2 for space and water heating			16.2703 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.6851 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.2703 * 1.00) + 2.6851 + 0.7664, rounded to 2 d.p.			19.7200 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	053	Issued on Date	29/04/2022
Assessment Reference	053	Prop Type Ref	
Property			
SAP Rating	83 B	DER	18.13
Environmental	88 B	TER	19.78
CO ₂ Emissions (t/year)	0.78	% DER<TER	8.36
General Requirements Compliance	Pass	DFEE	42.10
		TFEE	48.33
		% DFEE<TFEE	12.88
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 19.78 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 18.13 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)48.3 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)42.1 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing South East:	6.24 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Exposed floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)
Exposed			50.7900	0.1000	5.0790		(28b)
External Wall	23.2500	8.4500	14.8000	0.1500	2.2200		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Total net area of external elements Aum(A, m ²)					91.5400		(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 22.7671		(33)
Party Wall 1				33.3000	0.0000	0.0000	(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.2902 (36)
Total fabric heat loss							(33) + (36) = 34.0573 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	11.1341	11.0123	10.8905	10.2816	10.1599	9.5510	9.5510	9.4292	9.7945	10.1599	10.4034	10.6470 (38)
Average = Sum(39)m / 12 =	45.1914	45.0696	44.9478	44.3389	44.2171	43.6083	43.6083	43.4865	43.8518	44.2171	44.4607	44.7042 (39)
												44.3085 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8898	0.8874	0.8850	0.8730	0.8706	0.8586	0.8586	0.8562	0.8634	0.8706	0.8754	0.8802 (40)
Days in month												0.8724 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy content (annual)	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1178.3544 (45)
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)

[illegible]

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1006.6315 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1056.9631 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1920.6539 (310a)
Electricity used for heat distribution	29.7762 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	238.1302 (332)
Total delivered energy for all uses	3337.7384 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3326.9463	0.2160	718.6204 (367)
Electrical energy for heat distribution	29.7762	0.5190	15.4538 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			734.0742 (373)
Space and water heating			734.0742 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	238.1302	0.5190	123.5896 (379)
Total CO2, kg/year			920.9773 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			18.1300 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		18.1300 ZC1
Total Floor Area	TFA	50.7900
Assumed number of occupants	N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.4175 ZC2
CO2 emissions from cooking, equation (L16)		3.1526 ZC3
Total CO2 emissions		38.7001 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		38.7001 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 20.0000 / (5) = 0.1575 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4075 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
Effective ac	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)
Exposed			50.7900	0.1300	6.6027		(28b)
External Wall	23.2500	8.4500	14.8000	0.1800	2.6640		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Total net area of external elements Aum(A, m ²)			91.5400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1692		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.4442 (36)
Total fabric heat loss						(33) + (36) =	35.6134 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	24.3480	24.2160	24.0867	23.4794	23.3658	22.8368	22.8368	22.7389	23.0406	23.3658	23.5957	23.8360 (38)
Heat transfer coeff	59.9613	59.8294	59.7001	59.0928	58.9791	58.4502	58.4502	58.3522	58.6539	58.9791	59.2090	59.4493 (39)
Average = Sum(39)m / 12 =												59.0922 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1806	1.1780	1.1754	1.1635	1.1612	1.1508	1.1508	1.1489	1.1548	1.1612	1.1658	1.1705 (40)
HLP (average)												1.1635 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy content (annual)	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1178.3544 (45)
Water storage loss:	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
Heat gains from water heating, kWh/month	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415	(73)

6. Solar gains

[Jan]		Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W					
Southeast		6.2400	36.7938	0.6300	0.7000	0.7700	70.1668 (77)					
South		2.2100	46.7521	0.6300	0.7000	0.7700	31.5766 (78)					
Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains	421.2115	488.9806	537.3716	569.4289	581.3281	561.5651	541.7662	526.3621	510.2428	468.0154	419.7157	398.8747 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.8227	58.9524	59.0800	59.6872	59.8022	60.3434	60.3434	60.4447	60.1338	59.8022	59.5700	59.3292
alpha	4.9215	4.9302	4.9387	4.9791	4.9868	5.0229	5.0229	5.0296	5.0089	4.9868	4.9713	4.9553
util living area	0.9918	0.9823	0.9617	0.9119	0.8079	0.6345	0.4687	0.5014	0.7248	0.9233	0.9825	0.9936 (86)
MIT	19.9268	20.1115	20.3579	20.6389	20.8545	20.9671	20.9940	20.9916	20.9355	20.6655	20.2428	19.8902 (87)
Th 2	19.9356	19.9377	19.9397	19.9493	19.9511	19.9595	19.9595	19.9611	19.9563	19.9511	19.9475	19.9437 (88)
util rest of house	0.9892	0.9768	0.9497	0.8842	0.7514	0.5443	0.3610	0.3925	0.6398	0.8933	0.9760	0.9916 (89)
MIT 2	18.5327	18.8004	19.1526	19.5456	19.8164	19.9389	19.9575	19.9579	19.9102	19.5905	18.9995	18.4855 (90)
Living area fraction									fLA = Living area / (4) =			0.5025 (91)
MIT	19.2332	19.4592	19.7582	20.0949	20.3380	20.4556	20.4783	20.4773	20.4254	20.1306	19.6242	19.1913 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2332	19.4592	19.7582	20.0949	20.3380	20.4556	20.4783	20.4773	20.4254	20.1306	19.6242	19.1913 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9869	0.9737	0.9473	0.8885	0.7736	0.5886	0.4153	0.4474	0.6800	0.8992	0.9735	0.9896 (94)
Useful gains	415.6964	476.1129	509.0462	505.9472	449.7437	330.5525	225.0207	235.4976	346.9429	420.8370	408.5888	394.7383 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	895.4139	871.0669	791.5169	661.5390	509.4600	342.2594	226.6869	237.9205	371.0082	562.1088	741.5463	891.2219 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	356.9098	265.4091	210.1582	112.0261	44.4289	0.0000	0.0000	0.0000	0.0000	105.1062	239.7294	369.3838 (98)
Space heating												1703.1515 (98)
Space heating per m2										(98) / (4) =		33.5332 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												1821.5525 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	356.9098	265.4091	210.1582	112.0261	44.4289	0.0000	0.0000	0.0000	0.0000	105.1062	239.7294	369.3838 (98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000 (210)
Space heating fuel (main heating system)	381.7217	283.8600	224.7681	119.8141	47.5175	0.0000	0.0000	0.0000	0.0000	112.4131	256.3951	395.0629 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
Efficiency of water heater (217)m	86.7650	86.3387	85.5949	84.2040	82.1549	79.8000	79.8000	79.8000	79.8000	83.9477	85.9895	79.8000 (216)
Fuel for water heating, kWh/month	194.5082	172.5025	183.2531	167.7113	168.9879	156.2471	150.8144	164.4484	163.8315	174.4022	179.1431	189.7625 (219)
Water heating fuel used												2065.6122 (219)
Annual totals kWh/year												
Space heating fuel - main system												1821.5525 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												243.3763 (232)
Total delivered energy for all uses												4205.5410 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1821.5525	0.2160	393.4553 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2065.6122	0.2160	446.1722 (264)
Space and water heating			839.6276 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			1004.8649 (272)
Emissions per m2 for space and water heating			16.5314 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.5314 * 1.00) + 2.4870 + 0.7664, rounded to 2 d.p.			19.7800 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	054				Issued on Date	29/04/2022
Assessment Reference	054	Prop Type Ref				
Property						
SAP Rating	84 B	DER	15.22	TER	16.65	
Environmental	90 B	% DER<TER	8.56			
CO ₂ Emissions (t/year)	0.69	DFEE	29.49	TFEE	31.85	
General Requirements Compliance	Fail	% DFEE<TFEE	7.42			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.65 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.22 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)31.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)29.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing South East: 6.24 m², No overhang
Windows facing South: 2.21 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)
External Wall	23.2500	8.4500	14.8000	0.1500	2.2200		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Total net area of external elements Aum(A, m ²)				40.7500			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	17.6881		(33)
Party Wall 1			33.3000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.5730 (36)
Total fabric heat loss							(33) + (36) = 23.2611 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	11.1341	11.0123	10.8905	10.2816	10.1599	9.5510	9.5510	9.4292	9.7945	10.1599	10.4034	10.6470 (38)
Heat transfer coeff	34.3952	34.2734	34.1516	33.5427	33.4209	32.8121	32.8121	32.6903	33.0556	33.4209	33.6645	33.9080 (39)
Average = Sum(39)m / 12 =												33.5123 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.6772	0.6748	0.6724	0.6604	0.6580	0.6460	0.6460	0.6436	0.6508	0.6580	0.6628	0.6676 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (56)													
If cylinder contains dedicated solar storage													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (57)													
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month													
177.4469 156.7782 165.5372 149.6214 147.5136 133.0871 129.0318 139.9117 139.1394 155.0886 162.4461 173.5921 173.5921 (62)													
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
177.4469 156.7782 165.5372 149.6214 147.5136 133.0871 129.0318 139.9117 139.1394 155.0886 162.4461 173.5921 173.5921 (64)													
Total per year (kWh/year) = Sum(64)m =													1829.1942 (64)
Heat gains from water heating, kWh/month													
84.8430 75.4698 80.8830 74.7574 74.8902 69.2597 68.7450 72.3625 71.2721 77.4089 79.0216 83.5613 83.5613 (65)													

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
13.4839 11.9763 9.7398 7.3736 5.5119 4.6534 5.0281 6.5357 8.7723 11.1384 13.0002 13.8587 13.8587 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
149.2855 150.8347 146.9309 138.6204 128.1298 118.2701 111.6832 110.1341 114.0378 122.3484 132.8390 142.6987 142.6987 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 (69)													
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													
-68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 (71)													
Water heating gains (Table 5)													
114.0363 112.3063 108.7138 103.8297 100.6589 96.1941 92.3992 97.2615 98.9891 104.0442 109.7522 112.3135 112.3135 (72)													
Total internal gains													
325.5065 323.8179 314.0852 298.5244 283.0012 267.8182 257.8112 262.6320 270.4999 286.2317 304.2921 317.5716 317.5716 (73)													

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W	
Southeast					6.2400	36.7938	0.4000	0.8000			0.7700	50.9147 (77)	
South					2.2100	46.7521	0.4000	0.8000			0.7700	22.9127 (78)	

Solar gains	73.8274	124.2516	166.4633	201.0539	220.9821	217.6723	210.5612	195.8614	178.4200	136.3256	88.1434	63.3710 (83)	
Total gains	399.3338	448.0695	480.5485	499.5783	503.9832	485.4906	468.3724	458.4934	448.9198	422.5573	392.4355	380.9426 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
tau	102.5459	102.9103	103.2773	105.1520	105.5351	107.4935	107.4935	107.8940	106.7015	105.5351	104.7716	104.0191	104.0191
alpha	7.8364	7.8607	7.8852	8.0101	8.0357	8.1662	8.1662	8.1929	8.1134	8.0357	7.9848	7.9346	7.9346
util living area	0.9816	0.9566	0.9003	0.7783	0.6118	0.4323	0.3082	0.3280	0.5070	0.7859	0.9502	0.9860	0.9860 (86)
MIT	20.6309	20.7506	20.8733	20.9654	20.9950	20.9997	21.0000	21.0000	20.9991	20.9685	20.8071	20.6066	20.6066 (87)
Th 2	20.3610	20.3631	20.3653	20.3759	20.3781	20.3887	20.3887	20.3909	20.3845	20.3781	20.3738	20.3695	20.3695 (88)
util rest of house	0.9769	0.9466	0.8808	0.7463	0.5726	0.3911	0.2654	0.2845	0.4623	0.7487	0.9373	0.9823	0.9823 (89)
MIT 2	19.8800	20.0494	20.2162	20.3399	20.3737	20.3886	20.3887	20.3909	20.3838	20.3471	20.1389	19.8527	19.8527 (90)
Living area fraction									fLA = Living area / (4) =			0.5025	0.5025 (91)
MIT	20.2573	20.4017	20.5464	20.6542	20.6859	20.6957	20.6959	20.6969	20.6930	20.6593	20.4747	20.2315	20.2315 (92)
Temperature adjustment												0.0000	0.0000
adjusted MIT	20.2573	20.4017	20.5464	20.6542	20.6859	20.6957	20.6959	20.6969	20.6930	20.6593	20.4747	20.2315	20.2315 (93)

8. Space heating requirement

Utilisation	0.9760	0.9473	0.8867	0.7609	0.5921	0.4118	0.2869	0.3064	0.4848	0.7660	0.9396	0.9814	0.9814 (94)
Useful gains	389.7582	424.4592	426.0892	380.1139	298.4043	199.9271	134.3903	140.4617	217.6151	323.6626	368.7183	373.8613	373.8613 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	4.2000 (96)
Heat loss rate W													
548.8541 531.2971 479.7062 394.2683 300.3160 200.0113 134.3938 140.4677 217.9342 336.1928 450.2511 543.5979 543.5979 (97)													
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh													
118.3674 71.7952 39.8911 10.1912 1.4223 0.0000 0.0000 0.0000 0.0000 9.3224 58.7036 126.2840 126.2840 (98)													
Space heating													
Space heating per m2													8.5839 (99)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	435.9771	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	457.7760	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1829.1942	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1920.6539	(310a)
Electricity used for heat distribution	23.7843	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	121.9912	(330a)
Total electricity for the above, kWh/year	121.9912	(331)
Electricity for lighting (calculated in Appendix L)	238.1302	(332)
Total delivered energy for all uses	2738.5513	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	2657.4635	0.2160	574.0121 (367)
Electrical energy for heat distribution	23.7843	0.5190	12.3441 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			586.3562 (373)
Space and water heating			586.3562 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	238.1302	0.5190	123.5896 (379)
Total CO2, kg/year			773.2592 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.2200 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		15.2200	ZC1
Total Floor Area	TFA	50.7900	
Assumed number of occupants	N	1.7134	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.4175	ZC2
CO2 emissions from cooking, equation (L16)		3.1526	ZC3
Total CO2 emissions		35.7901	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		35.7901	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1575 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4075 (18)
					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)
External Wall	23.2500	8.4500	14.8000	0.1800	2.6640		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Total net area of external elements Aum(A, m ²)			40.7500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	18.5665	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.2380 (36)
Total fabric heat loss						(33) + (36) =	22.8045 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	24.3480	24.2160	24.0867	23.4794	23.3658	22.8368	22.8368
Heat transfer coeff	47.1524	47.0205	46.8912	46.2839	46.1702	45.6413	45.6413
Average = Sum(39)m / 12 =							
HLP	0.9284	0.9258	0.9232	0.9113	0.9090	0.8986	0.8986
HLP (average)							
Days in month	31	28	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

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If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Southeast				6.2400	36.7938	0.6300	0.7000	0.7700	70.1668 (77)			
South				2.2100	46.7521	0.6300	0.7000	0.7700	31.5766 (78)			
Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains	421.2115	488.9806	537.3716	569.4289	581.3281	561.5651	541.7662	526.3621	510.2428	468.0154	419.7157	398.8747 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.8018	75.0116	75.2185	76.2055	76.3930	77.2784	77.2784	77.4446	76.9349	76.3930	76.0145	75.6229	
alpha	5.9868	6.0008	6.0146	6.0804	6.0929	6.1519	6.1519	6.1630	6.1290	6.0929	6.0676	6.0415	
util living area	0.9889	0.9730	0.9370	0.8515	0.7041	0.5156	0.3702	0.3972	0.6070	0.8698	0.9729	0.9916	(86)
MIT	20.2853	20.4578	20.6597	20.8547	20.9612	20.9951	20.9995	20.9992	20.9871	20.8586	20.5428	20.2509	(87)
Th 2	20.1434	20.1456	20.1478	20.1579	20.1598	20.1687	20.1687	20.1703	20.1653	20.1598	20.1560	20.1520	(88)
util rest of house	0.9856	0.9656	0.9207	0.8180	0.6511	0.4507	0.3005	0.3260	0.5389	0.8326	0.9642	0.9891	(89)
MIT 2	19.2067	19.4548	19.7375	20.0014	20.1256	20.1656	20.1685	20.1700	20.1564	20.0134	19.5868	19.1638	(90)
Living area fraction	19.7487	19.9588	20.2009	20.4301	20.5455	20.5824	20.5860	20.5866	20.5738	20.4381	20.0671	19.7100	(92)
Temperature adjustment	19.7487	19.9588	20.2009	20.4301	20.5455	20.5824	20.5860	20.5866	20.5738	20.4381	20.0671	19.7100	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	414.3738	471.2466	495.3425	472.3095	393.0051	271.3738	181.7796	190.4392	292.2132	395.8707	404.2268	393.8933	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	728.4418	708.0700	642.4517	533.6598	408.3969	273.0447	181.9264	190.6722	296.7936	454.2273	601.6772	723.3942	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	233.6666	159.1454	109.4492	44.1722	11.4515	0.0000	0.0000	0.0000	0.0000	43.4173	142.1643	245.1486	(98)
Space heating												988.6151	(98)
Space heating per m2												19.4648	(99)

8c. Space cooling requirement

Not applicable

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9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1057.3423 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	233.6666	159.1454	109.4492	44.1722	11.4515	0.0000	0.0000	0.0000	0.0000	43.4173	142.1643	245.1486	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	249.9107	170.2090	117.0580	47.2430	12.2476	0.0000	0.0000	0.0000	0.0000	46.4356	152.0473	262.1911	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	85.6821	84.9908	83.8757	82.1132	80.5255	79.8000	79.8000	79.8000	79.8000	82.0180	84.6007	85.8696	(216)
Fuel for water heating, kWh/month	196.9666	175.2384	187.0092	171.9816	172.4072	156.2471	150.8144	164.4484	163.8315	178.5057	182.0840	192.0473	(219)
Water heating fuel used												2091.5813	(219)
Annual totals kWh/year													
Space heating fuel - main system												1057.3423	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												3467.3000	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1057.3423	0.2160	228.3859 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2091.5813	0.2160	451.7816 (264)
Space and water heating			680.1675 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			845.4048 (272)
Emissions per m2 for space and water heating			13.3918 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.3918 * 1.00) + 2.4870 + 0.7664, rounded to 2 d.p.			16.6500 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	055			Issued on Date	29/04/2022
Assessment Reference	055	Prop Type Ref			
Property					
SAP Rating	85 B	DER	13.97	TER	15.30
Environmental	90 B	% DER<TER	8.68		
CO ₂ Emissions (t/year)	0.88	DFEE	31.99	TFEE	36.66
General Requirements Compliance	Fail	% DFEE<TFEE	12.73		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 74 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 15.30 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.97 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)36.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)32.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing South East: 6.24 m², No overhang
Windows facing South: 2.21 m², No overhang
Windows facing South West: 6.47 m², No overhang
Windows facing West: 1.97 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Exposed floor U-value 0.10 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												75.6500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			16.8900	1.1450	19.3397		(27)
Exposed			3.0900	0.1000	0.3090		(28b)
External Wall	52.9300	16.8900	36.0400	0.1500	5.4060		(29a)
Corridor	5.4000	1.8900	3.5100	0.2500	0.8775		(29a)
Total net area of external elements Aum(A, m2)			61.4200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		27.8222		(33)
Party Wall 1			34.6500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.8768 (36)
Total fabric heat loss						(33) + (36) =	37.6990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	17.2447	17.0514	16.8580	15.8913	15.6980	14.7313	14.7313	14.5380	15.1180	15.6980	16.0847	16.4714 (38)
Average = Sum(39)m / 12 =	54.9437	54.7504	54.5570	53.5903	53.3970	52.4303	52.4303	52.2370	52.8170	53.3970	53.7837	54.1703 (39)
												53.5420 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7473	0.7447	0.7421	0.7289	0.7263	0.7131	0.7131	0.7105	0.7184	0.7263	0.7316	0.7368 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3285 (42)
Average daily hot water use (litres/day)													89.5010 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)	
Energy conte	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)	
Energy content (annual)												Total = Sum(45)m = 1408.1991 (45)	
Distribution loss (46)m = 0.15 x (45)m	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)	

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	201.2769	177.6201	187.0442	168.3717	165.5050	148.6122	143.4181	156.4202	155.8451	174.5575	183.6979	196.6701	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
	Solar input (sum of months) = Sum (63)m =											0.0000 (63)	
Output from w/h													
	201.2769	177.6201	187.0442	168.3717	165.5050	148.6122	143.4181	156.4202	155.8451	174.5575	183.6979	196.6701	(64)
	Total per year (kWh/year) = Sum (64)m =											2059.0388 (64)	
Heat gains from water heating, kWh/month													
	92.7665	82.3997	88.0341	80.9919	80.8723	74.4219	73.5284	77.8516	76.8268	83.8823	86.0878	91.2347	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3088	16.2617	13.2249	10.0121	7.4842	6.3185	6.8273	8.8744	11.9112	15.1240	17.6520	18.8177 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385 (71)
Water heating gains (Table 5)	124.6861	122.6187	118.3254	112.4887	108.6993	103.3637	98.8285	104.6393	106.7039	112.7450	119.5664	122.6273 (72)
Total internal gains	406.2912	404.3077	391.6074	371.1252	350.3761	330.3110	317.2233	322.9500	333.4217	354.1083	377.8894	395.6798 (73)

[Jan	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Southeast	6.2400	36.7938	0.4000	0.8000	0.7700	50.9147 (77)
South	2.2100	46.7521	0.4000	0.8000	0.7700	22.9127 (78)
Southwest	6.4700	36.7938	0.4000	0.8000	0.7700	52.7913 (79)
West	1.9700	19.6403	0.4000	0.8000	0.7700	8.5802 (80)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil/m (see Table 9a)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	92.9234	93.2516	93.5820	95.2701	95.6150	97.3779	97.3779	97.7383	96.6650	95.6150	94.9276	94.2500		
alpha	7.1949	7.2168	7.2388	7.3513	7.3743	7.4919	7.4919	7.5159	7.4443	7.3743	7.3285	7.2833		
util living area														
	0.9907	0.9718	0.9211	0.7965	0.6197	0.4364	0.3120	0.3384	0.5357	0.8356	0.9726	0.9934	(86)	
MIT	20.4746	20.6357	20.8093	20.9458	20.9916	20.9995	21.0000	20.9999	20.9977	20.9366	20.6924	20.4445	(87)	
Th 2	20.2992	20.3015	20.3038	20.3154	20.3177	20.3292	20.3292	20.3316	20.3246	20.3177	20.3130	20.3084	(88)	
util rest of house														
	0.9880	0.9646	0.9036	0.7631	0.5769	0.3909	0.2644	0.2893	0.4843	0.7989	0.9643	0.9915	(89)	
MIT 2	19.6045	19.8360	20.0760	20.2585	20.3104	20.3289	20.3292	20.3315	20.3230	20.2533	19.9283	19.5686	(90)	
Living area fraction									fLA = Living area / (4) =			0.3678	(91)	
MIT	19.9245	20.1301	20.3457	20.5113	20.5610	20.5755	20.5759	20.5774	20.5711	20.5046	20.2093	19.8907	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.9245	20.1301	20.3457	20.5113	20.5610	20.5755	20.5759	20.5774	20.5711	20.5046	20.2093	19.8907	(93)	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9863	0.9625	0.9047	0.7730	0.5923	0.4076	0.2819	0.3073	0.5032	0.8095	0.9628	0.9900 (94)
Useful gains	534.0596	611.4760	641.2085	591.2872	468.8092	313.0750	208.4472	218.1916	340.7415	493.5933	519.8913	506.1822 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
	858.4701	833.8536	755.3804	622.2544	473.1488	313.2993	208.4586	218.2129	341.7867	528.8760	705.0683	849.9714 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
	241.3614	149.4378	84.9439	22.2964	3.2287	0.0000	0.0000	0.0000	0.0000	26.2503	133.3274	255.7792 (98)
Space heating												
Space heating per m2												916.6251 (98)
											(98) / (4) =	12.4677 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	916.6251 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	962.4564 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2059.0388 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2161.9908 (310a)
Electricity used for heat distribution	31.2445 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	170.9800 (330a)
Total electricity for the above, kWh/year	170.9800 (331)
Electricity for lighting (calculated in Appendix L)	323.3395 (332)
Total delivered energy for all uses	3618.7666 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3491.0024	0.2160	754.0565 (367)
Electrical energy for heat distribution	31.2445	0.5190	16.2159 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			770.2724 (373)
Space and water heating			770.2724 (376)
Pumps and fans	170.9800	0.5190	88.7386 (378)
Energy for lighting	323.3395	0.5190	167.8132 (379)
Total CO2, kg/year			1026.8242 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			13.9700 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		13.9700 ZC1
Total Floor Area	TFA	73.5200
Assumed number of occupants	N	2.3285
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.5530 ZC2
CO2 emissions from cooking, equation (L16)		2.3787 ZC3
Total CO2 emissions		32.9017 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		32.9017 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1632 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4132 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3512 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4478	0.4390	0.4303	0.3864	0.3776	0.3337	0.3337	0.3249	0.3512	0.3776	0.3951	0.4127 (22b)
	0.6003	0.5964	0.5926	0.5746	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			16.4900	1.3258	21.8617		(27)
Exposed			3.0900	0.1300	0.4017		(28b)
External Wall	52.9300	16.4900	36.4400	0.1800	6.5592		(29a)
Corridor	5.4000	1.8900	3.5100	0.1800	0.6318		(29a)
Total net area of external elements Aum(A, m ²)			61.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.3444		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.8664 (36)
Total fabric heat loss						(33) + (36) =	39.2108 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.4091	36.1729	35.9414	34.8541	34.6506	33.7036	33.7036	33.5282	34.0684	34.6506	35.0622	35.4924 (38)
Heat transfer coeff	75.6199	75.3837	75.1523	74.0649	73.8615	72.9144	72.9144	72.7391	73.2792	73.8615	74.2730	74.7033 (39)
Average = Sum(39)m / 12 =												74.0639 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0286	1.0254	1.0222	1.0074	1.0046	0.9918	0.9918	0.9894	0.9967	1.0046	1.0102	1.0161 (40)
HLP (average)												1.0074 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy content (annual)	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1408.1991 (45)
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
Heat gains from water heating, kWh/month	85.8210	76.1264	81.0886	74.2704	73.9268	67.7004	66.5829	70.9061	70.1053	76.9367	79.3664	84.2892 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3070	16.2601	13.2236	10.0111	7.4834	6.3178	6.8266	8.8735	11.9100	15.1225	17.6502	18.8158	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	(71)
Water heating gains (Table 5)	115.3508	113.2833	108.9900	103.1533	99.3640	94.0283	89.4931	95.3039	97.3685	103.4096	110.2311	113.2919	(72)
Total internal gains	399.9539	397.9707	385.2706	364.7888	344.0400	323.9750	310.8872	316.6137	327.0851	347.7714	371.5522	389.3425	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d	Gains W		
Southeast				6.0900	36.7938	0.6300	0.7000		0.7700	68.4801 (77)		
South				2.1600	46.7521	0.6300	0.7000		0.7700	30.8622 (78)		
Southwest				6.3200	36.7938	0.6300	0.7000		0.7700	71.0663 (79)		
West				1.9200	19.6403	0.6300	0.7000		0.7700	11.5245 (80)		
Solar gains	181.9330	310.7877	426.7420	529.8924	593.5562	589.0095	567.9937	520.7143	462.5933	343.9756	218.0963	155.5675 (83)
Total gains	581.8870	708.7584	812.0126	894.6812	937.5962	912.9845	878.8809	837.3280	789.6784	691.7470	589.6485	544.9100 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	67.5160	67.7275	67.9362	68.9335	69.1234	70.0212	70.0212	70.1900	69.6726	69.1234	68.7404	68.3445	
alpha	5.5011	5.5152	5.5291	5.5956	5.6082	5.6681	5.6681	5.6793	5.6448	5.6082	5.5827	5.5563	
util living area	0.9924	0.9779	0.9413	0.8491	0.6934	0.5055	0.3643	0.3983	0.6207	0.8894	0.9807	0.9945	(86)
MIT	20.1046	20.3196	20.5745	20.8210	20.9517	20.9932	20.9991	20.9986	20.9797	20.7993	20.4047	20.0663	(87)
Th 2	20.0596	20.0623	20.0649	20.0772	20.0795	20.0902	20.0902	20.0922	20.0861	20.0795	20.0748	20.0699	(88)
util rest of house	0.9900	0.9715	0.9252	0.8136	0.6368	0.4362	0.2894	0.3204	0.5464	0.8538	0.9740	0.9928	(89)
MIT 2	18.8816	19.1923	19.5512	19.8852	20.0374	20.0861	20.0899	20.0916	20.0722	19.8689	19.3273	18.8338	(90)
Living area fraction									fLA = Living area / (4) =			0.3678	(91)
MIT	19.3314	19.6069	19.9276	20.2294	20.3737	20.4198	20.4243	20.4252	20.4060	20.2111	19.7236	19.2871	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3314	19.6069	19.9276	20.2294	20.3737	20.4198	20.4243	20.4252	20.4060	20.2111	19.7236	19.2871	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	574.6550	685.8360	749.0879	733.5510	614.5731	421.3740	278.5620	292.3011	452.5131	594.5128	572.4048	539.9046	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1136.6763	1108.6607	1009.1123	839.1086	640.6509	424.3447	278.8464	292.7890	462.0953	709.8883	937.5894	1127.0568	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	418.1438	284.1382	193.4581	76.0014	19.4018	0.0000	0.0000	0.0000	0.0000	85.8394	262.9329	436.8412	(98)
Space heating												1776.7570	(98)
Space heating per m2												24.1670	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												1900.2748 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	418.1438	284.1382	193.4581	76.0014	19.4018	0.0000	0.0000	0.0000	0.0000	85.8394	262.9329	436.8412 (98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000 (210)
Space heating fuel (main heating system)	447.2126	303.8911	206.9071	81.2850	20.7506	0.0000	0.0000	0.0000	0.0000	91.8069	281.2117	467.2099 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
Efficiency of water heater (217)m	86.8286	86.1780	85.0308	82.9591	80.8525	79.8000	79.8000	79.8000	79.8000	83.1527	85.8931	79.8000 (216)
Fuel for water heating, kWh/month	221.8106	197.0089	209.7620	192.8298	193.9620	175.7022	168.8423	185.1357	184.7660	199.4832	204.0863	86.9907 (217)
Water heating fuel used												216.1016 (219)
Annual totals kWh/year												2349.4907 (219)
Space heating fuel - main system												1900.2748 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												323.3067 (232)
Total delivered energy for all uses												4648.0723 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1900.2748	0.2160	410.4594 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2349.4907	0.2160	507.4900 (264)
Space and water heating			917.9494 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	323.3067	0.5190	167.7962 (268)
Total CO2, kg/m2/year			1124.6706 (272)
Emissions per m2 for space and water heating			12.4857 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2823 (272b)
Emissions per m2 for pumps and fans			0.5294 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.4857 * 1.00) + 2.2823 + 0.5294, rounded to 2 d.p.			15.3000 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	056			Issued on Date	29/04/2022
Assessment Reference	056	Prop Type Ref			
Property					
SAP Rating	85 B	DER	15.52	TER	16.80
Environmental	89 B	% DER<TER	7.61		
CO ₂ Emissions (t/year)	0.93	DFEE	38.93	TFEE	43.43
General Requirements Compliance	Pass	% DFEE<TFEE	10.36		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aecom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.80 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.52 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)43.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)38.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading: Average
Windows facing West: 5.93 m², No overhang
Windows facing North West: 7.10 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					0.0000 / (5) = 0.0000 (8)
Measured/design AP50					Yes
Infiltration rate					3.0000
Number of sides sheltered					0.1500 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			13.0300	1.1450	14.9198		(27)
External Wall	35.0800	13.0300	22.0500	0.1500	3.3075		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Core	18.2300		18.2300	0.2500	4.5575		(29a)
Total net area of external elements Aum(A, m ²)			70.8100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	28.5773			(33)
Party Wall 1			18.3000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.0260 (36)
Total fabric heat loss						(33) + (36) =	37.6033 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	17.0688	16.8774	16.6860	15.7292	15.5379	14.5811	14.5811	14.3897	14.9638	15.5379	15.9206	16.3033 (38)
Average = Sum(39)m / 12 =	54.6721	54.4808	54.2894	53.3326	53.1412	52.1844	52.1844	51.9930	52.5671	53.1412	53.5239	53.9067 (39)
												53.2847 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7513	0.7487	0.7460	0.7329	0.7303	0.7171	0.7171	0.7145	0.7224	0.7303	0.7355	0.7408 (40)
Days in month												0.7322 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy content (annual)	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1401.8427 (45)
	21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
	Solar input (sum of months) = Sum (63)m =											0.0000 (63)	
Output from w/h													
	200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(64)
	Total per year (kWh/year) = Sum (64)m =											2052.6825 (64)	
Heat gains from water heating, kWh/month													
	92.5474	82.2081	87.8363	80.8195	80.7069	74.2791	73.3961	77.6998	76.6732	83.7032	85.8924	91.0225	(65)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9951	0.9899	0.9706	0.8919	0.7122	0.4912	0.3443	0.3884	0.6582	0.9296	0.9881	0.9962 (94)
Useful gains	445.3617	483.7480	521.9366	532.7852	456.4696	311.4492	207.9112	217.5498	334.2148	424.1858	425.2105	427.5674 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	846.2743	817.9489	740.8079	614.5912	470.4620	312.2573	207.9593	217.6631	340.1959	520.5558	693.1968	838.9467 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	298.2790	224.5830	162.8402	58.9004	10.4104	0.0000	0.0000	0.0000	0.0000	71.6993	192.9501	306.0662 (98)
Space heating												1325.7286 (98)
Space heating per m2												18.2181 (99)
										(98) / (4) =		

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	1325.7286	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1392.0150	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	2052.6825	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2155.3166	(310a)
Electricity used for heat distribution	35.4733	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)		
mechanical ventilation fans (SFP = 0.7625)	169.2357	(330a)
Total electricity for the above, kWh/year	169.2357	(331)
Electricity for lighting (calculated in Appendix L)	322.2135	(332)
Total delivered energy for all uses	4038.7808	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3963.4990	0.2160	856.1158 (367)
Electrical energy for heat distribution	35.4733	0.5190	18.4107 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			874.5264 (373)
Space and water heating			874.5264 (376)
Pumps and fans	169.2357	0.5190	87.8333 (378)
Energy for lighting	322.2135	0.5190	167.2288 (379)
Total CO2, kg/year			1129.5886 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.5200 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		15.5200	ZC1
Total Floor Area	TFA	72.7700	
Assumed number of occupants	N	2.3115	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.5855	ZC2
CO2 emissions from cooking, equation (L16)		2.3976	ZC3
Total CO2 emissions		34.5031	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		34.5031	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1649 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4149 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3527 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4497	0.4408	0.4320	0.3879	0.3791	0.3350	0.3350	0.3262	0.3527	0.3791	0.3968	0.4144 (22b)
Effective ac	0.6011	0.5972	0.5933	0.5752	0.5719	0.5561	0.5561	0.5532	0.5622	0.5719	0.5787	0.5859 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			13.0300	1.3258	17.2746		(27)
External Wall	35.0800	13.0300	22.0500	0.1800	3.9690		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Core	18.2300		18.2300	0.1800	3.2814		(29a)
Total net area of external elements Aum(A, m ²)			70.8100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.2248		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.9338 (36)
Total fabric heat loss						(33) + (36) =	36.1586 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.0868	35.8511	35.6201	34.5351	34.3321	33.3870	33.3870	33.2120	33.7511	34.3321	34.7427	35.1721 (38)
Heat transfer coeff	72.2454	72.0097	71.7787	70.6937	70.4907	69.5457	69.5457	69.3707	69.9097	70.4907	70.9014	71.3307 (39)
Average = Sum(39)m / 12 =												70.6927 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9928	0.9896	0.9864	0.9715	0.9687	0.9557	0.9557	0.9533	0.9607	0.9687	0.9743	0.9802 (40)
HLP (average)												0.9715 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy content (annual)	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

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Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (64)
Heat gains from water heating, kWh/month	85.6018	75.9347	80.8908	74.0980	73.7613	67.5576	66.4506	70.7543	69.9517	76.7577	79.1709	84.0770 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5611	16.4858	13.4072	10.1501	7.5873	6.4055	6.9214	8.9967	12.0753	15.3324	17.8952	19.0770 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581 (71)
Water heating gains (Table 5)	115.0562	112.9981	108.7242	102.9139	99.1416	93.8300	89.3153	95.0999	97.1551	103.1690	109.9597	113.0067 (72)
Total internal gains	397.9629	395.9430	383.2645	362.8588	342.2112	322.2660	309.2806	315.0269	325.4868	346.0960	369.7620	387.4427 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
West				5.9300	19.6403	0.6300	0.7000			0.7700			35.5938 (80)
Northwest				7.1000	11.2829	0.6300	0.7000			0.7700			24.4823 (81)

Solar gains	60.0761	119.4634	204.4548	314.6920	403.1636	421.1192	397.4230	329.1693	242.7702	143.5223	75.1863	49.2641	(83)
Total gains	458.0390	515.4064	587.7193	677.5508	745.3747	743.3852	706.7036	644.1963	568.2570	489.6183	444.9483	436.7067	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.9487	70.1776	70.4035	71.4841	71.6899	72.6641	72.6641	72.8474	72.2857	71.6899	71.2747	70.8457	
alpha	5.6632	5.6785	5.6936	5.7656	5.7793	5.8443	5.8443	5.8565	5.8190	5.7793	5.7516	5.7230	
util living area	0.9974	0.9944	0.9828	0.9316	0.7927	0.5864	0.4311	0.4912	0.7754	0.9655	0.9943	0.9980 (86)	
MIT	20.0040	20.1401	20.3839	20.7010	20.9136	20.9877	20.9983	20.9964	20.9442	20.6525	20.2759	19.9845 (87)	
Th 2	20.0893	20.0920	20.0947	20.1072	20.1095	20.1204	20.1204	20.1224	20.1162	20.1095	20.1048	20.0998 (88)	
util rest of house	0.9966	0.9926	0.9771	0.9100	0.7403	0.5111	0.3460	0.3997	0.7018	0.9502	0.9921	0.9974 (89)	
MIT 2	18.7578	18.9580	19.3123	19.7639	20.0294	20.1127	20.1198	20.1210	20.0736	19.7086	19.1663	18.7372 (90)	
Living area fraction									fLA = Living area / (4) =				0.3848 (91)
MIT	19.2373	19.4129	19.7246	20.1245	20.3697	20.4494	20.4578	20.4579	20.4086	20.0718	19.5932	19.2171 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.2373	19.4129	19.7246	20.1245	20.3697	20.4494	20.4578	20.4579	20.4086	20.0718	19.5932	19.2171 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	455.9752	510.6463	572.5002	616.8998	563.9083	401.2764	267.7126	280.2491	413.5599	464.8498	440.6866	435.1803 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1079.1536	1045.0670	949.2458	793.4987	611.1296	406.7984	268.2928	281.4960	441.0304	667.6731	885.7866	1071.1833 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	463.6448	359.1307	280.2987	127.1512	35.1326	0.0000	0.0000	0.0000	0.0000	150.9006	320.4720	473.1862 (98)
Space heating												2209.9168 (98)
Space heating per m2										(98) / (4) =		30.3685 (99)

8c. Space cooling requirement

Not applicable

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2363.5474 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	463.6448	359.1307	280.2987	127.1512	35.1326	0.0000	0.0000	0.0000	0.0000	150.9006	320.4720	473.1862	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	495.8767	384.0970	299.7847	135.9906	37.5750	0.0000	0.0000	0.0000	0.0000	161.3910	342.7508	506.0815	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500	(64)
Efficiency of water heater (217)m	87.0815	86.7738	86.0237	84.2175	81.5697	79.8000	79.8000	79.8000	79.8000	84.5713	86.4121	79.8000	(216)
Fuel for water heating, kWh/month	220.4096	194.9920	206.6495	189.3327	191.6465	175.1642	168.3438	184.5636	184.1870	195.5004	202.1805	214.8896	(219)
Water heating fuel used												2327.8595	(219)
Annual totals kWh/year												2363.5474	(211)
Space heating fuel - main system												0.0000	(215)
Space heating fuel - secondary													
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												327.7949	(232)
Total delivered energy for all uses												5094.2017	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2363.5474	0.2160	510.5262 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2327.8595	0.2160	502.8176 (264)
Space and water heating			1013.3439 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	327.7949	0.5190	170.1255 (268)
Total CO2, kg/m2/year			1222.3944 (272)
Emissions per m2 for space and water heating			13.9253 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3379 (272b)
Emissions per m2 for pumps and fans			0.5349 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.9253 * 1.00) + 2.3379 + 0.5349, rounded to 2 d.p.			16.8000 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	057				Issued on Date	29/04/2022
Assessment Reference	057			Prop Type Ref		
Property						
SAP Rating	84 B	DER	15.85	TER	17.23	
Environmental	89 B	% DER<TER	8.00			
CO ₂ Emissions (t/year)	0.94	DFEE	40.33	TFEE	45.36	
General Requirements Compliance	Pass	% DFEE<TFEE	11.09			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aecom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.23 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.85 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)45.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)40.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading: Average
Windows facing North: 5.88 m², No overhang
Windows facing North West: 7.10 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												75.6500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			12.9800	1.1450	14.8626		(27)
External Wall	35.0800	12.9800	22.1000	0.1500	3.3150		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Core	18.2300		18.2300	0.2500	4.5575		(29a)
Total net area of external elements Aum(A, m ²)			70.8100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	28.5276			(33)
Party Wall 1			18.3000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.0240 (36)
Total fabric heat loss							(33) + (36) = 37.5516 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	17.0688	16.8774	16.6860	15.7292	15.5379	14.5811	14.5811	14.3897	14.9638	15.5379	15.9206	16.3033 (38)
Heat transfer coeff	54.6204	54.4290	54.2376	53.2808	53.0895	52.1327	52.1327	51.9413	52.5154	53.0895	53.4722	53.8549 (39)
Average = Sum(39)m / 12 =												53.2330 (39)
HLP	0.7506	0.7480	0.7453	0.7322	0.7296	0.7164	0.7164	0.7138	0.7217	0.7296	0.7348	0.7401 (40)
HLP (average)												0.7315 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy content (annual)	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1401.8427 (45)
	21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
	Solar input (sum of months) = Sum (63)m =											0.0000 (63)	
Output from w/h													
	200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(64)
	Total per year (kWh/year) = Sum (64)m =											2052.6825 (64)	
Heat gains from water heating, kWh/month													
	92.5474	82.2081	87.8363	80.8195	80.7069	74.2791	73.3961	77.6998	76.6732	83.7032	85.8924	91.0225	(65)

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1417.2605 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1488.1235 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2052.6825 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2155.3166 (310a)
Electricity used for heat distribution	36.4344 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	169.2357 (330a)
Total electricity for the above, kWh/year	169.2357 (331)
Electricity for lighting (calculated in Appendix L)	322.3254 (332)
Total delivered energy for all uses	4135.0012 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	4070.8828	0.2160	879.3107 (367)
Electrical energy for heat distribution	36.4344	0.5190	18.9095 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			898.2201 (373)
Space and water heating			898.2201 (376)
Pumps and fans	169.2357	0.5190	87.8333 (378)
Energy for lighting	322.3254	0.5190	167.2869 (379)
Total CO2, kg/year			1153.3404 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.8500 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		15.8500 ZC1
Total Floor Area	TFA	72.7700
Assumed number of occupants	N	2.3115
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.5855 ZC2
CO2 emissions from cooking, equation (L16)		2.3976 ZC3
Total CO2 emissions		34.8331 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		34.8331 ZC8

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1649 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4149 (18)
Number of sides sheltered					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3527 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4497	0.4408	0.4320	0.3879	0.3791	0.3350	0.3350	0.3262	0.3527	0.3791	0.3968	0.4144 (22b)
	0.6011	0.5972	0.5933	0.5752	0.5719	0.5561	0.5561	0.5532	0.5622	0.5719	0.5787	0.5859 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			12.9800	1.3258	17.2083		(27)
External Wall	35.0800	12.9800	22.1000	0.1800	3.9780		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Core	18.2300		18.2300	0.1800	3.2814		(29a)
Total net area of external elements Aum(A, m ²)			70.8100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 29.1675		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.9318 (36)
Total fabric heat loss							(33) + (36) = 36.0993 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.0868	35.8511	35.6201	34.5351	34.3321	33.3870	33.3870	33.2120	33.7511	34.3321	34.7427	35.1721 (38)
Heat transfer coeff	72.1861	71.9504	71.7194	70.6344	70.4314	69.4864	69.4864	69.3114	69.8504	70.4314	70.8421	71.2714 (39)
Average = Sum(39)m / 12 =												70.6334 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9920	0.9887	0.9856	0.9707	0.9679	0.9549	0.9549	0.9525	0.9599	0.9679	0.9735	0.9794 (40)
HLP (average)												0.9706 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)												Total = Sum(45)m = 1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m	21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (64)
Heat gains from water heating, kWh/month	85.6018	75.9347	80.8908	74.0980	73.7613	67.5576	66.4506	70.7543	69.9517	76.7577	79.1709	84.0770 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5727	16.4961	13.4155	10.1564	7.5920	6.4095	6.9257	9.0023	12.0829	15.3420	17.9064	19.0889 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581 (71)
Water heating gains (Table 5)	115.0562	112.9981	108.7242	102.9139	99.1416	93.8300	89.3153	95.0999	97.1551	103.1690	109.9597	113.0067 (72)
Total internal gains	397.9745	395.9533	383.2729	362.8651	342.2159	322.2700	309.2849	315.0325	325.4943	346.1056	369.7732	387.4546 (73)

6. Solar gains

[Jan				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				5.8800	10.6334		0.6300		0.7000		0.7700		19.1083 (74)
Northwest				7.1000	11.2829		0.6300		0.7000		0.7700		24.4823 (81)
Solar gains	43.5906	86.3513	151.8369	247.1241	332.4718	355.0441	331.8703	264.0557	184.0109	104.3702	54.3776	35.9231	(83)
Total gains	441.5651	482.3046	535.1098	609.9892	674.6877	677.3141	641.1552	579.0882	509.5053	450.4758	424.1508	423.3777	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	70.0062	70.2355	70.4617	71.5441	71.7503	72.7261	72.7261	72.9097	72.3471	71.7503	71.3343	70.9046
alpha	5.6671	5.6824	5.6974	5.7696	5.7834	5.8484	5.8484	5.8606	5.8231	5.7834	5.7556	5.7270
util living area	0.9979	0.9960	0.9889	0.9545	0.8397	0.6362	0.4736	0.5430	0.8287	0.9760	0.9955	0.9983 (86)
MIT	19.9836	20.0984	20.3204	20.6365	20.8819	20.9815	20.9972	20.9941	20.9201	20.6091	20.2500	19.9681 (87)
Th 2	20.0900	20.0927	20.0954	20.1079	20.1102	20.1211	20.1211	20.1231	20.1169	20.1102	20.1055	20.1005 (88)
util rest of house	0.9972	0.9946	0.9849	0.9385	0.7919	0.5574	0.3808	0.4434	0.7605	0.9646	0.9938	0.9978 (89)
MIT 2	18.7286	18.8981	19.2224	19.6795	19.9967	20.1091	20.1200	20.1207	20.0527	19.6502	19.1293	18.7138 (90)
Living area fraction									fLA = Living area / (4) =			0.3848 (91)
MIT	19.2115	19.3600	19.6449	20.0477	20.3373	20.4448	20.4575	20.4567	20.3864	20.0191	19.5605	19.1964 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2115	19.3600	19.6449	20.0477	20.3373	20.4448	20.4575	20.4567	20.3864	20.0191	19.5605	19.1964 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	439.8910	479.0073	525.7142	571.6804	543.1729	397.7128	267.0934	279.0667	399.0692	433.8591	420.8839	422.1033 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1076.4016	1040.4026	942.7446	787.4135	608.3350	406.1338	268.0464	281.1779	439.1104	663.4031	882.7278	1068.8176 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	473.5639	377.2577	310.2706	155.3278	48.4806	0.0000	0.0000	0.0000	0.0000	170.7807	332.5276	481.1554 (98)
Space heating												2349.3643 (98)
Space heating per m2										(98) / (4) =		32.2848 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2512.6891 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	473.5639	377.2577	310.2706	155.3278	48.4806	0.0000	0.0000	0.0000	0.0000	170.7807	332.5276	481.1554	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	506.4855	403.4841	331.8402	166.1260	51.8509	0.0000	0.0000	0.0000	0.0000	182.6532	355.6445	514.6047	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500	(64)
Efficiency of water heater (217)m	87.1305	86.8925	86.2858	84.7441	82.0977	79.8000	79.8000	79.8000	79.8000	84.9002	86.5049	79.8000	(216)
Fuel for water heating, kWh/month	220.2856	194.7257	206.0218	188.1562	190.4140	175.1642	168.3438	184.5636	184.1870	194.7429	201.9634	214.7958	(219)
Water heating fuel used												2323.3639	(219)
Annual totals kWh/year													
Space heating fuel - main system												2512.6891	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												327.9999	(232)
Total delivered energy for all uses												5239.0529	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2512.6891	0.2160	542.7409 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2323.3639	0.2160	501.8466 (264)
Space and water heating			1044.5875 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	327.9999	0.5190	170.2319 (268)
Total CO2, kg/m2/year			1253.7444 (272)
Emissions per m2 for space and water heating			14.3546 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3393 (272b)
Emissions per m2 for pumps and fans			0.5349 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.3546 * 1.00) + 2.3393 + 0.5349, rounded to 2 d.p.			17.2300 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	058				Issued on Date	29/04/2022
Assessment Reference	058			Prop Type Ref		
Property						
SAP Rating	85 B	DER	14.58	TER	15.88	
Environmental	89 B	% DER<TER	8.20			
CO ₂ Emissions (t/year)	0.90	DFEE	35.01	TFEE	39.57	
General Requirements Compliance	Fail	% DFEE<TFEE	11.53			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 74 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 15.88 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.58 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)39.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)35.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading: Average
Windows facing North: 1.97 m², No overhang
Windows facing North East: 9.35 m², No overhang
Windows facing South East: 6.24 m², No overhang
Windows facing South: 2.21 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main		secondary		other		total		m3 per hour			
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)			
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)			
Number of intermittent fans							0 * 10 =	0.0000	(7a)			
Number of passive vents							0 * 10 =	0.0000	(7b)			
Number of flueless gas fires							0 * 40 =	0.0000	(7c)			
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000	(8)			
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							2	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500	(20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1275	(21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			19.7700	1.1450	22.6374		(27)					
External Wall	49.6500	19.7700	29.8800	0.1500	4.4820		(29a)					
Corridor	5.4000	1.8900	3.5100	0.2500	0.8775		(29a)					
Total net area of external elements Aum(A, m2)			55.0500				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		29.8869		(33)					
Party Wall 1			38.0500	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.8790 (36)					
Total fabric heat loss							(33) + (36) = 38.7659 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 17.2447	Feb 17.0514	Mar 16.8580	Apr 15.8913	May 15.6980	Jun 14.7313	Jul 14.7313	Aug 14.5380	Sep 15.1180	Oct 15.6980	Nov 16.0847	Dec 16.4714 (38)
Heat transfer coeff	56.0106	55.8173	55.6239	54.6573	54.4639	53.4972	53.4972	53.3039	53.8839	54.4639	54.8506	55.2373 (39)
Average = Sum(39)m / 12 =	54.6089 (39)											
HLP	Jan 0.7618	Feb 0.7592	Mar 0.7566	Apr 0.7434	May 0.7408	Jun 0.7277	Jul 0.7277	Aug 0.7250	Sep 0.7329	Oct 0.7408	Nov 0.7461	Dec 0.7513 (40)
HLP (average)	0.7428 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	Jan 98.4511	Feb 94.8710	Mar 91.2910	Apr 87.7110	May 84.1309	Jun 80.5509	Jul 80.5509	Aug 84.1309	Sep 87.7110	Oct 91.2910	Nov 94.8710	Dec 98.4511 (44)
Energy conte	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Energy content (annual)												Total = Sum(45)m = 1408.1991 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (56)													
If cylinder contains dedicated solar storage													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (57)													
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month													
201.2769 177.6201 187.0442 168.3717 165.5050 148.6122 143.4181 156.4202 155.8451 174.5575 183.6979 196.6701 196.6701 (62)													
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
201.2769 177.6201 187.0442 168.3717 165.5050 148.6122 143.4181 156.4202 155.8451 174.5575 183.6979 196.6701 196.6701 (64)													
Total per year (kWh/year) = Sum(64)m =													2059.0388 (64)
Heat gains from water heating, kWh/month													
92.7665 82.3997 88.0341 80.9919 80.8723 74.4219 73.5284 77.8516 76.8268 83.8823 86.0878 91.2347 91.2347 (65)													

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)													
(66)m 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 (66)													
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
18.3088 16.2617 13.2249 10.0121 7.4842 6.3185 6.8273 8.8744 11.9112 15.1240 17.6520 18.8177 18.8177 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
205.3693 207.5004 202.1301 190.6974 176.2657 162.7019 153.6405 151.5094 156.8797 168.3123 182.7441 196.3078 196.3078 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 (69)													
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													
-93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 (71)													
Water heating gains (Table 5)													
124.6861 122.6187 118.3254 112.4887 108.6993 103.3637 98.8285 104.6393 106.7039 112.7450 119.5664 122.6273 122.6273 (72)													
Total internal gains													
406.2912 404.3077 391.6074 371.1252 350.3761 330.3110 317.2233 322.9500 333.4217 354.1083 377.8894 395.6798 395.6798 (73)													

6. Solar gains

[Jan]													
Area m2													
Solar flux Table 6a W/m2													
Specific data or Table 6b													
Specific data or Table 6c													
Access factor Table 6d													
Gains W													
North 1.9700 10.6334 0.4000 0.8000 0.7700 4.6454 (74)													
Northeast 9.3500 11.2829 0.4000 0.8000 0.7700 23.3947 (75)													
Southeast 6.2400 36.7938 0.4000 0.8000 0.7700 50.9147 (77)													
South 2.2100 46.7521 0.4000 0.8000 0.7700 22.9127 (78)													
Solar gains	101.8674	180.7497	267.3455	366.1880	443.0248	454.5378	432.0793	372.3330	301.1023	205.0893	123.3106	86.3489	86.3489 (83)
Total gains	508.1586	585.0574	658.9529	737.3132	793.4010	784.8488	749.3025	695.2830	634.5240	559.1976	501.2000	482.0287	482.0287 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)													
tau 91.1534 91.4691 91.7870 93.4104 93.7420 95.4359 95.4359 95.7820 94.7510 93.7420 93.0811 92.4296 92.4296 (86)													
alpha 7.0769 7.0979 7.1191 7.2274 7.2495 7.3624 7.3624 7.3855 7.3167 7.2495 7.2054 7.1620 7.1620 (86)													
util living area 0.9939 0.9829 0.9462 0.8257 0.6293 0.4357 0.3141 0.3526 0.5810 0.8843 0.9828 0.9956 0.9956 (86)													
MIT 20.4085 20.5549 20.7481 20.9275 20.9900 20.9994 21.0000 20.9999 20.9957 20.9008 20.6279 20.3828 20.3828 (87)													
Th 2 20.2865 20.2888 20.2911 20.3026 20.3049 20.3165 20.3165 20.3188 20.3118 20.3049 20.3003 20.2957 20.2957 (88)													
util rest of house 0.9921 0.9781 0.9326 0.7935 0.5853 0.3894 0.2653 0.3004 0.5252 0.8526 0.9771 0.9943 0.9943 (89)													
MIT 2 19.4987 19.7113 19.9836 20.2254 20.2963 20.3161 20.3165 20.3187 20.3089 20.2002 19.8271 19.4689 19.4689 (90)													
Living area fraction fLA = Living area / (4) =													
MIT 19.8333 20.0216 20.2648 20.4837 20.5514 20.5674 20.5678 20.5693 20.5615 20.4579 20.1217 19.8050 19.8050 (92)													
Temperature adjustment													
adjusted MIT 19.8333 20.0216 20.2648 20.4837 20.5514 20.5674 20.5678 20.5693 20.5615 20.4579 20.1217 19.8050 19.8050 (93)													

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.9906 0.9760 0.9320 0.8022 0.6011 0.4064 0.2833 0.3196 0.5456 0.8602 0.9754 0.9931 0.9931 (94)													
Useful gains	503.3943	571.0204	614.1598	591.4907	476.8897	318.9883	212.2543	222.2048	346.2103	481.0006	488.8805	478.6925	478.6925 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	4.2000 (96)
Heat loss rate W													
870.0310 844.0458 765.6507 633.1314 482.0830 319.2402 212.2684 222.2380 348.1693 536.8993 714.2454 861.9785 861.9785 (97)													
Month fracti 1.0000 1.0000 1.0000 1.0000 1.0000 0.0000 0.0000 0.0000 0.0000 1.0000 1.0000 1.0000 1.0000 (97a)													
Space heating kWh													
272.7777 183.4730 112.7093 29.9813 3.8638 0.0000 0.0000 0.0000 0.0000 41.5886 162.2628 285.1648 285.1648 (98)													
Space heating													
Space heating per m2													
(98) / (4) =													14.8507 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1091.8213 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1146.4123 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating:	
Annual water heating requirement	2059.0388 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2161.9908 (310a)
Electricity used for heat distribution	33.0840 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	170.9800 (330a)
Total electricity for the above, kWh/year	170.9800 (331)
Electricity for lighting (calculated in Appendix L)	323.3395 (332)
Total delivered energy for all uses	3802.7226 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3696.5398	0.2160	798.4526 (367)
Electrical energy for heat distribution	33.0840	0.5190	17.1706 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			815.6232 (373)
Space and water heating			815.6232 (376)
Pumps and fans	170.9800	0.5190	88.7386 (378)
Energy for lighting	323.3395	0.5190	167.8132 (379)
Total CO2, kg/year			1072.1750 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.5800 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		14.5800 ZC1
Total Floor Area	TFA	73.5200
Assumed number of occupants	N	2.3285
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.5530 ZC2
CO2 emissions from cooking, equation (L16)		2.3787 ZC3
Total CO2 emissions		33.5117 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		33.5117 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1632 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4132 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3512 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4478	0.4390	0.4303	0.3864	0.3776	0.3337	0.3337	0.3249	0.3512	0.3776	0.3951	0.4127 (22b)
	0.6003	0.5964	0.5926	0.5746	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			16.4900	1.3258	21.8617			(27)					
External Wall	49.6500	16.4900	33.1600	0.1800	5.9688			(29a)					
Corridor	5.4000	1.8900	3.5100	0.1800	0.6318			(29a)					
Total net area of external elements Aum(A, m2)			55.0500					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.3523			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								6.8038 (36)					
Total fabric heat loss						(33) + (36) =		37.1561 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 36.4091	Feb 36.1729	Mar 35.9414	Apr 34.8541	May 34.6506	Jun 33.7036	Jul 33.7036	Aug 33.5282	Sep 34.0684	Oct 34.6506	Nov 35.0622	Dec 35.4924	(38)
Heat transfer coeff	73.5652	73.3290	73.0976	72.0102	71.8068	70.8597	70.8597	70.6844	71.2245	71.8068	72.2183	72.6486	(39)
Average = Sum(39)m / 12 =												72.0092	(39)
HLP	Jan 1.0006	Feb 0.9974	Mar 0.9943	Apr 0.9795	May 0.9767	Jun 0.9638	Jul 0.9638	Aug 0.9614	Sep 0.9688	Oct 0.9767	Nov 0.9823	Dec 0.9881	(40)
HLP (average)												0.9795	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy conte	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Energy content (annual)										Total = Sum(45)m =		1408.1991 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
	85.8210	76.1264	81.0886	74.2704	73.9268	67.7004	66.5829	70.9061	70.1053	76.9367	79.3664	84.2892 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3070	16.2601	13.2236	10.0111	7.4834	6.3178	6.8266	8.8735	11.9100	15.1225	17.6502	18.8158	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	(71)
Water heating gains (Table 5)	115.3508	113.2833	108.9900	103.1533	99.3640	94.0283	89.4931	95.3039	97.3685	103.4096	110.2311	113.2919	(72)
Total internal gains	399.9539	397.9707	385.2706	364.7888	344.0400	323.9750	310.8872	316.6137	327.0851	347.7714	371.5522	389.3425	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g	Specific data or Table 6b	FF	Specific data or Table 6c	Access factor Table 6d	Gains W	
North				1.6400	10.6334		0.6300		0.7000	0.7700	5.3295 (74)	
Northeast				7.8000	11.2829		0.6300		0.7000	0.7700	26.8961 (75)	
Southeast				5.2100	36.7938		0.6300		0.7000	0.7700	58.5847 (77)	
South				1.8400	46.7521		0.6300		0.7000	0.7700	26.2900 (78)	
Solar gains	117.1003	207.7804	307.3298	420.9574	509.2861	522.5203	496.7031	428.0215	346.1363	235.7610	141.7505	99.2609 (83)
Total gains	517.0543	605.7511	692.6005	785.7462	853.3261	846.4953	807.5903	744.6353	673.2214	583.5324	513.3027	488.6034 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4018	69.6253	69.8458	70.9004	71.1013	72.0516	72.0516	72.2303	71.6826	71.1013	70.6961	70.2774	
alpha	5.6268	5.6417	5.6564	5.7267	5.7401	5.8034	5.8034	5.8154	5.7788	5.7401	5.7131	5.6852	
util living area	0.9955	0.9886	0.9668	0.8916	0.7311	0.5290	0.3851	0.4347	0.6937	0.9345	0.9893	0.9967	(86)
MIT	20.0627	20.2356	20.4869	20.7749	20.9420	20.9925	20.9990	20.9980	20.9677	20.7343	20.3464	20.0345	(87)
Th 2	20.0828	20.0855	20.0881	20.1005	20.1028	20.1136	20.1136	20.1156	20.1094	20.1028	20.0981	20.0932	(88)
util rest of house	0.9941	0.9850	0.9567	0.8622	0.6757	0.4587	0.3081	0.3522	0.6181	0.9095	0.9853	0.9956	(89)
MIT 2	18.8383	19.0908	19.4514	19.8513	20.0511	20.1090	20.1132	20.1148	20.0863	19.8098	19.2626	18.8052	(90)
Living area fraction	19.2886	19.5119	19.8322	20.1910	20.3788	20.4339	20.4390	20.4397	20.4105	20.1498	19.6612	19.2573	(92)
Temperature adjustment	19.2886	19.5119	19.8322	20.1910	20.3788	20.4339	20.4390	20.4397	20.4105	20.1498	19.6612	19.2573	(93)
adjusted MIT	19.2886	19.5119	19.8322	20.1910	20.3788	20.4339	20.4390	20.4397	20.4105	20.1498	19.6612	19.2573	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9925	0.9822	0.9533	0.8655	0.6935	0.4844	0.3364	0.3826	0.6447	0.9110	0.9828	0.9943	(94)
Ext temp.	513.1554	594.9614	660.2356	680.0534	591.7424	410.0613	271.7045	284.8721	433.9977	531.5940	504.4973	485.8236	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1102.6431	1071.4748	974.5544	813.0649	623.1941	413.3898	272.0310	285.5411	449.4632	685.7406	907.1498	1093.8932	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	438.5788	320.2170	233.8531	95.7682	23.4001	0.0000	0.0000	0.0000	0.0000	114.6851	289.9098	452.4038	(98)
Space heating per m2												1968.8160	(98)
												26.7793	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2105.6855 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	438.5788	320.2170	233.8531	95.7682	23.4001	0.0000	0.0000	0.0000	0.0000	114.6851	289.9098	452.4038	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	469.0682	342.4781	250.1103	102.4259	25.0269	0.0000	0.0000	0.0000	0.0000	122.6578	310.0639	483.8543	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882	(64)
Efficiency of water heater (217)m	86.9428	86.4821	85.5373	83.4968	81.0441	79.8000	79.8000	79.8000	79.8000	83.8526	86.1474	87.0727	(216)
Fuel for water heating, kWh/month	221.5193	196.3161	208.5198	191.5879	193.5033	175.7022	168.8423	185.1357	184.7660	197.8181	203.4839	215.8979	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													2105.6855 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													75.0000 (231)
Electricity for lighting (calculated in Appendix L)													323.3067 (232)
Total delivered energy for all uses													4847.0848 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2105.6855	0.2160	454.8281 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2343.0925	0.2160	506.1080 (264)
Space and water heating			960.9361 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	323.3067	0.5190	167.7962 (268)
Total CO2, kg/m2/year			1167.6573 (272)
Emissions per m2 for space and water heating			13.0704 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2823 (272b)
Emissions per m2 for pumps and fans			0.5294 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.0704 * 1.00) + 2.2823 + 0.5294, rounded to 2 d.p.			15.8800 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	059			Issued on Date	29/04/2022
Assessment Reference	059	Prop Type Ref			
Property					
SAP Rating	84 B	DER	15.04	TER	16.44
Environmental	90 B	% DER<TER	8.51		
CO ₂ Emissions (t/year)	0.69	DFEE	28.59	TFEE	30.75
General Requirements Compliance	Fail	% DFEE<TFEE	7.05		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.44 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.04 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)30.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)28.6 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing South East: 6.24 m², No overhang
Windows facing South: 2.21 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

					main	secondary	other			total	m3 per hour	
					heating		heating					
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Air changes per hour												
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =										0.0000 / (5) =	0.0000 (8)	
Pressure test										Yes		
Measured/design AP50										3.0000		
Infiltration rate										0.1500 (18)		
Number of sides sheltered										3 (19)		
Shelter factor										(20) = 1 - [0.075 x (19)] =	0.7750 (20)	
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =	0.1163 (21)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)					
External Wall	19.8500	8.4500	11.4000	0.1500	1.7100		(29a)					
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)					
Total net area of external elements Aum(A, m2)				37.3500			(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	17.1781		(33)					
Party Wall 1				37.0000	0.0000	0.0000	(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.3010 (36)					
Total fabric heat loss							(33) + (36) = 22.4791 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 11.1341	Feb 11.0123	Mar 10.8905	Apr 10.2816	May 10.1599	Jun 9.5510	Jul 9.5510	Aug 9.4292	Sep 9.7945	Oct 10.1599	Nov 10.4034	Dec 10.6470 (38)
Heat transfer coeff	33.6132	33.4914	33.3696	32.7607	32.6389	32.0301	32.0301	31.9083	32.2736	32.6389	32.8825	33.1260 (39)
Average = Sum(39)m / 12 =	32.7303 (39)											
HLP	Jan 0.6618	Feb 0.6594	Mar 0.6570	Apr 0.6450	May 0.6426	Jun 0.6306	Jul 0.6306	Aug 0.6282	Sep 0.6354	Oct 0.6426	Nov 0.6474	Dec 0.6522 (40)
HLP (average)	0.6444 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan 82.3820	Feb 79.3863	Mar 76.3906	Apr 73.3949	May 70.3992	Jun 67.4035	Jul 67.4035	Aug 70.3992	Sep 73.3949	Oct 76.3906	Nov 79.3863	Dec 82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												

store volume													110.0000	(47)
b) If manufacturer declared loss factor is not known :														
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152	(51)
Volume factor from Table 2a													1.0294	(52)
Temperature factor from Table 2b													0.6000	(53)
Enter (49) or (54) in (55)													1.0327	(55)
Total storage loss														
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage														
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	(59)
Total heat required for water heating calculated for each month														
177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	62		
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =													0.0000	(63)
Output from w/h														
177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	64		
Total per year (kWh/year) = Sum(64)m =													1829.1942	(64)
Heat gains from water heating, kWh/month														
84.8430	75.4698	80.8830	74.7574	74.8902	69.2597	68.7450	72.3625	71.2721	77.4089	79.0216	83.5613	65		

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.4839	11.9763	9.7398	7.3736	5.5119	4.6534	5.0281	6.5357	8.7723	11.1384	13.0002	13.8587 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	114.0363	112.3063	108.7138	103.8297	100.6589	96.1941	92.3992	97.2615	98.9891	104.0442	109.7522	112.3135 (72)
Total internal gains	325.5065	323.8179	314.0852	298.5244	283.0012	267.8182	257.8112	262.6320	270.4999	286.2317	304.2921	317.5716 (73)

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
Southeast					6.2400	36.7938	0.4000	0.8000	0.7700	50.9147		
South					2.2100	46.7521	0.4000	0.8000	0.7700	22.9127 (77)		
Solar gains	73.8274	124.2516	166.4633	201.0539	220.9821	217.6723	210.5612	195.8614	178.4200	136.3256	88.1434	63.3710 (83)
Total gains	399.3338	448.0695	480.5485	499.5783	503.9832	485.4906	468.3724	458.4934	448.9198	422.5573	392.4355	380.9426 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	104.9316	105.3132	105.6975	107.6620	108.0637	110.1179	110.1179	110.5382	109.2869	108.0637	107.2633	106.4746
alpha	7.9954	8.0209	8.0465	8.1775	8.2042	8.3412	8.3412	8.3692	8.2858	8.2042	8.1509	8.0983
util living area	0.9801	0.9528	0.8925	0.7654	0.5985	0.4221	0.3009	0.3201	0.4953	0.7731	0.9457	0.9849 (86)
MIT	20.6551	20.7720	20.8883	20.9714	20.9961	20.9998	21.0000	21.0000	20.9993	20.9740	20.8251	20.6313 (87)
Th 2	20.3747	20.3768	20.3790	20.3896	20.3918	20.4025	20.4025	20.4047	20.3982	20.3918	20.3875	20.3832 (88)
util rest of house	0.9751	0.9424	0.8724	0.7336	0.5607	0.3827	0.2600	0.2787	0.4524	0.7361	0.9322	0.9810 (89)
MIT 2	19.9260	20.0911	20.2483	20.3601	20.3885	20.4024	20.4025	20.4046	20.3977	20.3663	20.1755	19.8996 (90)
Living area fraction									fLA = Living area / (4) =			0.5025 (91)
MIT	20.2923	20.4332	20.5699	20.6673	20.6938	20.7026	20.7027	20.7038	20.7000	20.6717	20.5019	20.2672 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2923	20.4332	20.5699	20.6673	20.6938	20.7026	20.7027	20.7038	20.7000	20.6717	20.5019	20.2672 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9743	0.9434	0.8788	0.7483	0.5796	0.4025	0.2806	0.2995	0.4740	0.7535	0.9349	0.9801 (94)
Useful gains	389.0906	422.7138	422.3265	373.8561	292.0836	195.4067	131.4079	137.3222	212.7735	318.4011	366.9023	373.3650 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	537.5533	520.2289	469.5056	385.5045	293.5476	195.4658	131.4102	137.3262	213.0061	328.7281	440.6885	532.2430 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	110.4563	65.5301	35.1012	8.3869	1.0892	0.0000	0.0000	0.0000	0.0000	7.6833	53.1261	118.2052 (98)
Space heating												399.5783 (98)
Space heating per m2												(98) / (4) = 7.8673 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	399.5783	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	419.5572	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1829.1942	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1920.6539	(310a)
Electricity used for heat distribution	23.4021	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	121.9912	(330a)
Total electricity for the above, kWh/year	121.9912	(331)
Electricity for lighting (calculated in Appendix L)	238.1302	(332)
Total delivered energy for all uses	2700.3326	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	2614.7610	0.2160	564.7884 (367)
Electrical energy for heat distribution	23.4021	0.5190	12.1457 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			576.9341 (373)
Space and water heating			576.9341 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	238.1302	0.5190	123.5896 (379)
Total CO2, kg/year			763.8371 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.0400 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER	15.0400	ZC1
Total Floor Area	50.7900	TFA
Assumed number of occupants	1.7134	N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	EF
CO2 emissions from appliances, equation (L14)	17.4175	ZC2
CO2 emissions from cooking, equation (L16)	3.1526	ZC3
Total CO2 emissions	35.6101	ZC4
Residual CO2 emissions offset from biofuel CHP	0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year	0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000	ZC7
Net CO2 emissions	35.6101	ZC8

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					20.0000 / (5) = 0.1575 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4075 (18)
					3 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)					
External Wall	19.8500	8.4500	11.4000	0.1800	2.0520		(29a)					
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)					
Total net area of external elements Aum(A, m2)			37.3500				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	17.9545	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.9726 (36)					
Total fabric heat loss						(33) + (36) =	21.9271 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 24.3480	Feb 24.2160	Mar 24.0867	Apr 23.4794	May 23.3658	Jun 22.8368	Jul 22.8368	Aug 22.7389	Sep 23.0406	Oct 23.3658	Nov 23.5957	Dec 23.8360 (38)
Heat transfer coeff	46.2750	46.1431	46.0138	45.4065	45.2928	44.7639	44.7639	44.6659	44.9676	45.2928	45.5227	45.7630 (39)
Average = Sum(39)m / 12 =												45.4059 (39)
HLP	Jan 0.9111	Feb 0.9085	Mar 0.9060	Apr 0.8940	May 0.8918	Jun 0.8814	Jul 0.8814	Aug 0.8794	Sep 0.8854	Oct 0.8918	Nov 0.8963	Dec 0.9010 (40)
HLP (average)												0.8940 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan 82.3820	Feb 79.3863	Mar 76.3906	Apr 73.3949	May 70.3992	Jun 67.4035	Jul 67.4035	Aug 70.3992	Sep 73.3949	Oct 76.3906	Nov 79.3863	Dec 82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Southeast				6.2400	36.7938	0.6300	0.7000	0.7700	70.1668 (77)						
South				2.2100	46.7521	0.6300	0.7000	0.7700	31.5766 (78)						
Solar gains				101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains				421.2115	488.9806	537.3716	569.4289	581.3281	561.5651	541.7662	526.3621	510.2428	468.0154	419.7157	398.8747 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.2201	76.4380	76.6527	77.6780	77.8729	78.7931	78.7931	78.9659	78.4360	77.8729	77.4796	77.0728	
alpha	6.0813	6.0959	6.1102	6.1785	6.1915	6.2529	6.2529	6.2644	6.2291	6.1915	6.1653	6.1382	
util living area	0.9885	0.9719	0.9340	0.8448	0.6945	0.5064	0.3631	0.3897	0.5970	0.8637	0.9717	0.9913	(86)
MIT	20.3109	20.4822	20.6801	20.8674	20.9660	20.9959	20.9996	20.9993	20.9890	20.8704	20.5639	20.2768	(87)
Th 2	20.1581	20.1603	20.1624	20.1726	20.1745	20.1834	20.1834	20.1850	20.1800	20.1745	20.1707	20.1666	(88)
util rest of house	0.9851	0.9642	0.9172	0.8109	0.6422	0.4435	0.2960	0.3210	0.5307	0.8261	0.9627	0.9888	(89)
MIT 2	19.2552	19.5011	19.7776	20.0303	20.1446	20.1809	20.1832	20.1848	20.1725	20.0408	19.6284	19.2126	(90)
Living area fraction	19.7857	19.9941	20.2311	20.4509	20.5573	20.5904	20.5934	20.5940	20.5828	20.4576	20.0985	19.7473	(92)
Temperature adjustment	19.7857	19.9941	20.2311	20.4509	20.5573	20.5904	20.5934	20.5940	20.5828	20.4576	20.0985	19.7473	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	414.1906	470.6253	493.6878	468.6099	387.7337	266.7692	178.6433	187.1444	287.6236	393.0711	403.6655	393.7698	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	716.5988	696.4889	631.8178	524.4873	401.1745	268.1535	178.7602	187.3311	291.5146	446.4798	591.7263	711.4923	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	224.9917	151.7803	102.7687	40.2317	9.9999	0.0000	0.0000	0.0000	0.0000	39.7361	135.4038	236.3855	(98)
Space heating												941.2977	(98)
Space heating per m2												18.5331	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1006.7355 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	224.9917	151.7803	102.7687	40.2317	9.9999	0.0000	0.0000	0.0000	0.0000	39.7361	135.4038	236.3855	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	240.6328	162.3319	109.9130	43.0286	10.6951	0.0000	0.0000	0.0000	0.0000	42.4985	144.8169	252.8187	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	85.5817	84.8643	83.7181	81.9482	80.4390	79.8000	79.8000	79.8000	79.8000	81.8662	84.4721	85.7737	(216)
Fuel for water heating, kWh/month	197.1976	175.4996	187.3614	172.3278	172.5926	156.2471	150.8144	164.4484	163.8315	178.8365	182.3612	192.2618	(219)
Water heating fuel used												2093.7800	(219)
Annual totals kWh/year													
Space heating fuel - main system												1006.7355	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												3418.8918	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1006.7355	0.2160	217.4549 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2093.7800	0.2160	452.2565 (264)
Space and water heating			669.7113 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			834.9486 (272)
Emissions per m2 for space and water heating			13.1859 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.1859 * 1.00) + 2.4870 + 0.7664, rounded to 2 d.p.			16.4400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	060			Issued on Date	29/04/2022
Assessment Reference	060	Prop Type Ref			
Property					
SAP Rating	84 B	DER	15.22	TER	16.65
Environmental	90 B	% DER<TER	8.56		
CO ₂ Emissions (t/year)	0.69	DFEE	29.49	TFEE	31.85
General Requirements Compliance	Fail	% DFEE<TFEE	7.42		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.65 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.22 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)31.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)29.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing South East: 6.24 m², No overhang
Windows facing South: 2.21 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)
External Wall	23.2500	8.4500	14.8000	0.1500	2.2200		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Total net area of external elements Aum(A, m ²)				40.7500			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	17.6881		(33)
Party Wall 1			33.3000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.5730 (36)
Total fabric heat loss							(33) + (36) = 23.2611 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	11.1341	11.0123	10.8905	10.2816	10.1599	9.5510	9.5510	9.4292	9.7945	10.1599	10.4034	10.6470 (38)
Heat transfer coeff	34.3952	34.2734	34.1516	33.5427	33.4209	32.8121	32.8121	32.6903	33.0556	33.4209	33.6645	33.9080 (39)
Average = Sum(39)m / 12 =												33.5123 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.6772	0.6748	0.6724	0.6604	0.6580	0.6460	0.6460	0.6436	0.6508	0.6580	0.6628	0.6676 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (56)													
If cylinder contains dedicated solar storage													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (57)													
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month													
177.4469 156.7782 165.5372 149.6214 147.5136 133.0871 129.0318 139.9117 139.1394 155.0886 162.4461 173.5921 173.5921 (62)													
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
177.4469 156.7782 165.5372 149.6214 147.5136 133.0871 129.0318 139.9117 139.1394 155.0886 162.4461 173.5921 173.5921 (64)													
Total per year (kWh/year) = Sum(64)m =													1829.1942 (64)
Heat gains from water heating, kWh/month													
84.8430 75.4698 80.8830 74.7574 74.8902 69.2597 68.7450 72.3625 71.2721 77.4089 79.0216 83.5613 83.5613 (65)													

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
13.4839 11.9763 9.7398 7.3736 5.5119 4.6534 5.0281 6.5357 8.7723 11.1384 13.0002 13.8587 13.8587 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
149.2855 150.8347 146.9309 138.6204 128.1298 118.2701 111.6832 110.1341 114.0378 122.3484 132.8390 142.6987 142.6987 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 (69)													
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													
-68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 (71)													
Water heating gains (Table 5)													
114.0363 112.3063 108.7138 103.8297 100.6589 96.1941 92.3992 97.2615 98.9891 104.0442 109.7522 112.3135 112.3135 (72)													
Total internal gains													
325.5065 323.8179 314.0852 298.5244 283.0012 267.8182 257.8112 262.6320 270.4999 286.2317 304.2921 317.5716 317.5716 (73)													

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W	
Southeast					6.2400	36.7938	0.4000	0.8000			0.7700	50.9147 (77)	
South					2.2100	46.7521	0.4000	0.8000			0.7700	22.9127 (78)	
Solar gains	73.8274	124.2516	166.4633	201.0539	220.9821	217.6723	210.5612	195.8614	178.4200	136.3256	88.1434	63.3710 (83)	
Total gains	399.3338	448.0695	480.5485	499.5783	503.9832	485.4906	468.3724	458.4934	448.9198	422.5573	392.4355	380.9426 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
tau	102.5459	102.9103	103.2773	105.1520	105.5351	107.4935	107.4935	107.8940	106.7015	105.5351	104.7716	104.0191	104.0191
alpha	7.8364	7.8607	7.8852	8.0101	8.0357	8.1662	8.1662	8.1929	8.1134	8.0357	7.9848	7.9346	7.9346
util living area	0.9816	0.9566	0.9003	0.7783	0.6118	0.4323	0.3082	0.3280	0.5070	0.7859	0.9502	0.9860	0.9860 (86)
MIT	20.6309	20.7506	20.8733	20.9654	20.9950	20.9997	21.0000	21.0000	20.9991	20.9685	20.8071	20.6066	20.6066 (87)
Th 2	20.3610	20.3631	20.3653	20.3759	20.3781	20.3887	20.3887	20.3909	20.3845	20.3781	20.3738	20.3695	20.3695 (88)
util rest of house	0.9769	0.9466	0.8808	0.7463	0.5726	0.3911	0.2654	0.2845	0.4623	0.7487	0.9373	0.9823	0.9823 (89)
MIT 2	19.8800	20.0494	20.2162	20.3399	20.3737	20.3886	20.3887	20.3909	20.3838	20.3471	20.1389	19.8527	19.8527 (90)
Living area fraction									fLA = Living area / (4) =			0.5025	0.5025 (91)
MIT	20.2573	20.4017	20.5464	20.6542	20.6859	20.6957	20.6959	20.6969	20.6930	20.6593	20.4747	20.2315	20.2315 (92)
Temperature adjustment												0.0000	0.0000
adjusted MIT	20.2573	20.4017	20.5464	20.6542	20.6859	20.6957	20.6959	20.6969	20.6930	20.6593	20.4747	20.2315	20.2315 (93)

8. Space heating requirement

Utilisation	0.9760	0.9473	0.8867	0.7609	0.5921	0.4118	0.2869	0.3064	0.4848	0.7660	0.9396	0.9814	0.9814 (94)
Useful gains	389.7582	424.4592	426.0892	380.1139	298.4043	199.9271	134.3903	140.4617	217.6151	323.6626	368.7183	373.8613	373.8613 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	4.2000 (96)
Heat loss rate W													
548.8541 531.2971 479.7062 394.2683 300.3160 200.0113 134.3938 140.4677 217.9342 336.1928 450.2511 543.5979 543.5979 (97)													
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh													
118.3674 71.7952 39.8911 10.1912 1.4223 0.0000 0.0000 0.0000 0.0000 9.3224 58.7036 126.2840 126.2840 (98)													
Space heating													
Space heating per m2													8.5839 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	435.9771	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	457.7760	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1829.1942	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1920.6539	(310a)
Electricity used for heat distribution	23.7843	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	121.9912	(330a)
Total electricity for the above, kWh/year	121.9912	(331)
Electricity for lighting (calculated in Appendix L)	238.1302	(332)
Total delivered energy for all uses	2738.5513	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	2657.4635	0.2160	574.0121 (367)
Electrical energy for heat distribution	23.7843	0.5190	12.3441 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			586.3562 (373)
Space and water heating			586.3562 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	238.1302	0.5190	123.5896 (379)
Total CO2, kg/year			773.2592 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.2200 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		15.2200	ZC1
Total Floor Area	TFA	50.7900	
Assumed number of occupants	N	1.7134	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.4175	ZC2
CO2 emissions from cooking, equation (L16)		3.1526	ZC3
Total CO2 emissions		35.7901	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		35.7901	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1575 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4075 (18)
					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)
External Wall	23.2500	8.4500	14.8000	0.1800	2.6640		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Total net area of external elements Aum(A, m2)			40.7500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =			18.5665	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							250.0000 (35)
Total fabric heat loss							(33) + (36) = 22.8045 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	Jan 24.3480	Feb 24.2160	Mar 24.0867	Apr 23.4794	May 23.3658	Jun 22.8368	Jul 22.8368
Heat transfer coeff	Aug 22.7389	Sep 23.0406	Oct 23.3658	Nov 23.5957	Dec 23.8360	(38)	
Average = Sum(39)m / 12 =	47.1524	47.0205	46.8912	46.2839	46.1702	45.6413	45.6413
	45.5433	45.8450	46.1702	46.4001	46.6404	(39)	
					46.2833	(39)	
HLP	Jan 0.9284	Feb 0.9258	Mar 0.9232	Apr 0.9113	May 0.9090	Jun 0.8986	Jul 0.8986
HLP (average)	Aug 0.8967	Sep 0.9026	Oct 0.9090	Nov 0.9136	Dec 0.9183	(40)	
Days in month	31	28	31	30	31	30	31
							(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan 82.3820	Feb 79.3863	Mar 76.3906	Apr 73.3949	May 70.3992	Jun 67.4035	Jul 67.4035	Aug 70.3992	Sep 73.3949	Oct 76.3906	Nov 79.3863	Dec 82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Southeast				6.2400	36.7938	0.6300	0.7000	0.7700	70.1668 (77)			
South				2.2100	46.7521	0.6300	0.7000	0.7700	31.5766 (78)			
Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains	421.2115	488.9806	537.3716	569.4289	581.3281	561.5651	541.7662	526.3621	510.2428	468.0154	419.7157	398.8747 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.8018	75.0116	75.2185	76.2055	76.3930	77.2784	77.2784	77.4446	76.9349	76.3930	76.0145	75.6229	
alpha	5.9868	6.0008	6.0146	6.0804	6.0929	6.1519	6.1519	6.1630	6.1290	6.0929	6.0676	6.0415	
util living area	0.9889	0.9730	0.9370	0.8515	0.7041	0.5156	0.3702	0.3972	0.6070	0.8698	0.9729	0.9916	(86)
MIT	20.2853	20.4578	20.6597	20.8547	20.9612	20.9951	20.9995	20.9992	20.9871	20.8586	20.5428	20.2509	(87)
Th 2	20.1434	20.1456	20.1478	20.1579	20.1598	20.1687	20.1687	20.1703	20.1653	20.1598	20.1560	20.1520	(88)
util rest of house	0.9856	0.9656	0.9207	0.8180	0.6511	0.4507	0.3005	0.3260	0.5389	0.8326	0.9642	0.9891	(89)
MIT 2	19.2067	19.4548	19.7375	20.0014	20.1256	20.1656	20.1685	20.1700	20.1564	20.0134	19.5868	19.1638	(90)
Living area fraction	19.7487	19.9588	20.2009	20.4301	20.5455	20.5824	20.5860	20.5866	20.5738	20.4381	20.0671	19.7100	(92)
Temperature adjustment	19.7487	19.9588	20.2009	20.4301	20.5455	20.5824	20.5860	20.5866	20.5738	20.4381	20.0671	19.7100	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	414.3738	471.2466	495.3425	472.3095	393.0051	271.3738	181.7796	190.4392	292.2132	395.8707	404.2268	393.8933	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	728.4418	708.0700	642.4517	533.6598	408.3969	273.0447	181.9264	190.6722	296.7936	454.2273	601.6772	723.3942	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	233.6666	159.1454	109.4492	44.1722	11.4515	0.0000	0.0000	0.0000	0.0000	43.4173	142.1643	245.1486	(98)
Space heating												988.6151	(98)
Space heating per m2												19.4648	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1057.3423 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	233.6666	159.1454	109.4492	44.1722	11.4515	0.0000	0.0000	0.0000	0.0000	43.4173	142.1643	245.1486	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	249.9107	170.2090	117.0580	47.2430	12.2476	0.0000	0.0000	0.0000	0.0000	46.4356	152.0473	262.1911	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	85.6821	84.9908	83.8757	82.1132	80.5255	79.8000	79.8000	79.8000	79.8000	82.0180	84.6007	85.8696	(216)
Fuel for water heating, kWh/month	196.9666	175.2384	187.0092	171.9816	172.4072	156.2471	150.8144	164.4484	163.8315	178.5057	182.0840	192.0473	(219)
Water heating fuel used												2091.5813	(219)
Annual totals kWh/year													
Space heating fuel - main system												1057.3423	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												3467.3000	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1057.3423	0.2160	228.3859 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2091.5813	0.2160	451.7816 (264)
Space and water heating			680.1675 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			845.4048 (272)
Emissions per m2 for space and water heating			13.3918 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.3918 * 1.00) + 2.4870 + 0.7664, rounded to 2 d.p.			16.6500 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	061				Issued on Date	29/04/2022
Assessment Reference	061			Prop Type Ref		
Property						
SAP Rating	84 B	DER	15.22	TER	16.65	
Environmental	90 B	% DER<TER	8.56			
CO ₂ Emissions (t/year)	0.69	DFEE	29.49	TFEE	31.85	
General Requirements Compliance	Fail	% DFEE<TFEE	7.42			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.65 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.22 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)31.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)29.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing South East: 6.24 m², No overhang
Windows facing South: 2.21 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							3	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.7750 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1163 (21)				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)					
External Wall	23.2500	8.4500	14.8000	0.1500	2.2200		(29a)					
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)					
Total net area of external elements Aum(A, m2)			40.7500				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		17.6881		(33)					
Party Wall 1			33.3000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.5730 (36)					
Total fabric heat loss							(33) + (36) = 23.2611 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 11.1341	Feb 11.0123	Mar 10.8905	Apr 10.2816	May 10.1599	Jun 9.5510	Jul 9.5510	Aug 9.4292	Sep 9.7945	Oct 10.1599	Nov 10.4034	Dec 10.6470 (38)
Heat transfer coeff	34.3952	34.2734	34.1516	33.5427	33.4209	32.8121	32.8121	32.6903	33.0556	33.4209	33.6645	33.9080 (39)
Average = Sum(39)m / 12 =	33.5123 (39)											
HLP	Jan 0.6772	Feb 0.6748	Mar 0.6724	Apr 0.6604	May 0.6580	Jun 0.6460	Jul 0.6460	Aug 0.6436	Sep 0.6508	Oct 0.6580	Nov 0.6628	Dec 0.6676 (40)
HLP (average)	0.6598 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan 82.3820	Feb 79.3863	Mar 76.3906	Apr 73.3949	May 70.3992	Jun 67.4035	Jul 67.4035	Aug 70.3992	Sep 73.3949	Oct 76.3906	Nov 79.3863	Dec 82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												

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Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (56)													
If cylinder contains dedicated solar storage													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (57)													
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month													
177.4469 156.7782 165.5372 149.6214 147.5136 133.0871 129.0318 139.9117 139.1394 155.0886 162.4461 173.5921 173.5921 (62)													
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
177.4469 156.7782 165.5372 149.6214 147.5136 133.0871 129.0318 139.9117 139.1394 155.0886 162.4461 173.5921 173.5921 (64)													
Total per year (kWh/year) = Sum(64)m =													1829.1942 (64)
Heat gains from water heating, kWh/month													
84.8430 75.4698 80.8830 74.7574 74.8902 69.2597 68.7450 72.3625 71.2721 77.4089 79.0216 83.5613 83.5613 (65)													

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
13.4839 11.9763 9.7398 7.3736 5.5119 4.6534 5.0281 6.5357 8.7723 11.1384 13.0002 13.8587 13.8587 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
149.2855 150.8347 146.9309 138.6204 128.1298 118.2701 111.6832 110.1341 114.0378 122.3484 132.8390 142.6987 142.6987 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 (69)													
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													
-68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 (71)													
Water heating gains (Table 5)													
114.0363 112.3063 108.7138 103.8297 100.6589 96.1941 92.3992 97.2615 98.9891 104.0442 109.7522 112.3135 112.3135 (72)													
Total internal gains													
325.5065 323.8179 314.0852 298.5244 283.0012 267.8182 257.8112 262.6320 270.4999 286.2317 304.2921 317.5716 317.5716 (73)													

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W	
Southeast					6.2400	36.7938	0.4000	0.8000			0.7700	50.9147 (77)	
South					2.2100	46.7521	0.4000	0.8000			0.7700	22.9127 (78)	

Solar gains	73.8274	124.2516	166.4633	201.0539	220.9821	217.6723	210.5612	195.8614	178.4200	136.3256	88.1434	63.3710 (83)	
Total gains	399.3338	448.0695	480.5485	499.5783	503.9832	485.4906	468.3724	458.4934	448.9198	422.5573	392.4355	380.9426 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
tau	102.5459	102.9103	103.2773	105.1520	105.5351	107.4935	107.4935	107.8940	106.7015	105.5351	104.7716	104.0191	104.0191
alpha	7.8364	7.8607	7.8852	8.0101	8.0357	8.1662	8.1662	8.1929	8.1134	8.0357	7.9848	7.9346	7.9346
util living area	0.9816	0.9566	0.9003	0.7783	0.6118	0.4323	0.3082	0.3280	0.5070	0.7859	0.9502	0.9860	0.9860 (86)
MIT	20.6309	20.7506	20.8733	20.9654	20.9950	20.9997	21.0000	21.0000	20.9991	20.9685	20.8071	20.6066	20.6066 (87)
Th 2	20.3610	20.3631	20.3653	20.3759	20.3781	20.3887	20.3887	20.3909	20.3845	20.3781	20.3738	20.3695	20.3695 (88)
util rest of house	0.9769	0.9466	0.8808	0.7463	0.5726	0.3911	0.2654	0.2845	0.4623	0.7487	0.9373	0.9823	0.9823 (89)
MIT 2	19.8800	20.0494	20.2162	20.3399	20.3737	20.3886	20.3887	20.3909	20.3838	20.3471	20.1389	19.8527	19.8527 (90)
Living area fraction									fLA = Living area / (4) =			0.5025	0.5025 (91)
MIT	20.2573	20.4017	20.5464	20.6542	20.6859	20.6957	20.6959	20.6969	20.6930	20.6593	20.4747	20.2315	20.2315 (92)
Temperature adjustment												0.0000	0.0000
adjusted MIT	20.2573	20.4017	20.5464	20.6542	20.6859	20.6957	20.6959	20.6969	20.6930	20.6593	20.4747	20.2315	20.2315 (93)

8. Space heating requirement

Utilisation	0.9760	0.9473	0.8867	0.7609	0.5921	0.4118	0.2869	0.3064	0.4848	0.7660	0.9396	0.9814	0.9814 (94)
Useful gains	389.7582	424.4592	426.0892	380.1139	298.4043	199.9271	134.3903	140.4617	217.6151	323.6626	368.7183	373.8613	373.8613 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	4.2000 (96)
Heat loss rate W													
548.8541 531.2971 479.7062 394.2683 300.3160 200.0113 134.3938 140.4677 217.9342 336.1928 450.2511 543.5979 543.5979 (97)													
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh													
118.3674 71.7952 39.8911 10.1912 1.4223 0.0000 0.0000 0.0000 0.0000 9.3224 58.7036 126.2840 126.2840 (98)													
Space heating													
Space heating per m2													8.5839 (99)

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8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	435.9771 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	457.7760 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1920.6539 (310a)
Electricity used for heat distribution	23.7843 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	238.1302 (332)
Total delivered energy for all uses	2738.5513 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	2657.4635	0.2160	574.0121 (367)
Electrical energy for heat distribution	23.7843	0.5190	12.3441 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			586.3562 (373)
Space and water heating			586.3562 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	238.1302	0.5190	123.5896 (379)
Total CO2, kg/year			773.2592 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.2200 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		15.2200 ZC1
Total Floor Area	TFA	50.7900
Assumed number of occupants	N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.4175 ZC2
CO2 emissions from cooking, equation (L16)		3.1526 ZC3
Total CO2 emissions		35.7901 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		35.7901 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 20.0000 / (5) = 0.1575 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4075 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
Effective ac	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)
External Wall	23.2500	8.4500	14.8000	0.1800	2.6640		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Total net area of external elements Aum(A, m ²)			40.7500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.5665		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.2380 (36)
Total fabric heat loss						(33) + (36) =	22.8045 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	24.3480	24.2160	24.0867	23.4794	23.3658	22.8368	22.8368
Heat transfer coeff	47.1524	47.0205	46.8912	46.2839	46.1702	45.6413	45.6413
Average = Sum(39)m / 12 =						45.5433	45.8450
							46.1702
							46.4001
							46.6404 (39)
							46.2833 (39)
HLP	0.9284	0.9258	0.9232	0.9113	0.9090	0.8986	0.8986
HLP (average)						0.8967	0.9026
Days in month	31	28	31	30	31	30	31
							0.9090
							0.9136
							0.9183 (40)
							0.9113 (40)
							31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

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If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415	(73)

6. Solar gains

[Jan]		Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W					
Southeast		6.2400	36.7938	0.6300	0.7000	0.7700	70.1668 (77)					
South		2.2100	46.7521	0.6300	0.7000	0.7700	31.5766 (78)					
Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains	421.2115	488.9806	537.3716	569.4289	581.3281	561.5651	541.7662	526.3621	510.2428	468.0154	419.7157	398.8747 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.8018	75.0116	75.2185	76.2055	76.3930	77.2784	77.2784	77.4446	76.9349	76.3930	76.0145	75.6229	
alpha	5.9868	6.0008	6.0146	6.0804	6.0929	6.1519	6.1519	6.1630	6.1290	6.0929	6.0676	6.0415	
util living area	0.9889	0.9730	0.9370	0.8515	0.7041	0.5156	0.3702	0.3972	0.6070	0.8698	0.9729	0.9916 (86)	
MIT	20.2853	20.4578	20.6597	20.8547	20.9612	20.9951	20.9995	20.9992	20.9871	20.8586	20.5428	20.2509 (87)	
Th 2	20.1434	20.1456	20.1478	20.1579	20.1598	20.1687	20.1687	20.1703	20.1653	20.1598	20.1560	20.1520 (88)	
util rest of house	0.9856	0.9656	0.9207	0.8180	0.6511	0.4507	0.3005	0.3260	0.5389	0.8326	0.9642	0.9891 (89)	
MIT 2	19.2067	19.4548	19.7375	20.0014	20.1256	20.1656	20.1685	20.1700	20.1564	20.0134	19.5868	19.1638 (90)	
Living area fraction	19.7487	19.9588	20.2009	20.4301	20.5455	20.5824	20.5860	20.5866	20.5738	20.4381	20.0671	19.7100 (92)	
Temperature adjustment	19.7487	19.9588	20.2009	20.4301	20.5455	20.5824	20.5860	20.5866	20.5738	20.4381	20.0671	19.7100 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9838	0.9637	0.9218	0.8294	0.6760	0.4832	0.3355	0.3618	0.5727	0.8458	0.9631	0.9875 (94)	
Ext temp.	414.3738	471.2466	495.3425	472.3095	393.0051	271.3738	181.7796	190.4392	292.2132	395.8707	404.2268	393.8933 (95)	
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Month fracti	728.4418	708.0700	642.4517	533.6598	408.3969	273.0447	181.9264	190.6722	296.7936	454.2273	601.6772	723.3942 (97)	
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)	
Space heating per m2	233.6666	159.1454	109.4492	44.1722	11.4515	0.0000	0.0000	0.0000	0.0000	43.4173	142.1643	245.1486 (98)	
												988.6151 (98)	
												19.4648 (99)	

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1057.3423 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	233.6666	159.1454	109.4492	44.1722	11.4515	0.0000	0.0000	0.0000	0.0000	43.4173	142.1643	245.1486	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	249.9107	170.2090	117.0580	47.2430	12.2476	0.0000	0.0000	0.0000	0.0000	46.4356	152.0473	262.1911	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	85.6821	84.9908	83.8757	82.1132	80.5255	79.8000	79.8000	79.8000	79.8000	82.0180	84.6007	85.8696	(216)
Fuel for water heating, kWh/month	196.9666	175.2384	187.0092	171.9816	172.4072	156.2471	150.8144	164.4484	163.8315	178.5057	182.0840	192.0473	(219)
Water heating fuel used												2091.5813	(219)
Annual totals kWh/year													
Space heating fuel - main system												1057.3423	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												3467.3000	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1057.3423	0.2160	228.3859 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2091.5813	0.2160	451.7816 (264)
Space and water heating			680.1675 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			845.4048 (272)
Emissions per m2 for space and water heating			13.3918 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.3918 * 1.00) + 2.4870 + 0.7664, rounded to 2 d.p.			16.6500 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	062				Issued on Date	29/04/2022
Assessment Reference	062			Prop Type Ref		
Property						
SAP Rating	85 B	DER	13.75	TER	15.07	
Environmental	90 B	% DER<TER	8.77			
CO ₂ Emissions (t/year)	0.87	DFEE	31.04	TFEE	35.49	
General Requirements Compliance	Fail	% DFEE<TFEE	12.55			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 74 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 15.07 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.75 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)35.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)31.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading: Average
Windows facing South East: 6.24 m², No overhang
Windows facing South: 2.21 m², No overhang
Windows facing South West: 6.47 m², No overhang
Windows facing West: 1.97 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							2	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1275 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			16.8900	1.1450	19.3397		(27)					
External Wall	52.9300	16.8900	36.0400	0.1500	5.4060		(29a)					
Corridor	5.4000	1.8900	3.5100	0.2500	0.8775		(29a)					
Total net area of external elements Aum(A, m2)			58.3300				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		27.5132		(33)					
Party Wall 1			34.6500	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.9400 (36)					
Total fabric heat loss							(33) + (36) = 36.4532 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 17.2447	Feb 17.0514	Mar 16.8580	Apr 15.8913	May 15.6980	Jun 14.7313	Jul 14.7313	Aug 14.5380	Sep 15.1180	Oct 15.6980	Nov 16.0847	Dec 16.4714 (38)
Heat transfer coeff	53.6979	53.5046	53.3112	52.3445	52.1512	51.1845	51.1845	50.9912	51.5712	52.1512	52.5379	52.9245 (39)
Average = Sum(39)m / 12 =	52.2962 (39)											
HLP	Jan 0.7304	Feb 0.7278	Mar 0.7251	Apr 0.7120	May 0.7093	Jun 0.6962	Jul 0.6962	Aug 0.6936	Sep 0.7015	Oct 0.7093	Nov 0.7146	Dec 0.7199 (40)
HLP (average)	0.7113 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	Jan 98.4511	Feb 94.8710	Mar 91.2910	Apr 87.7110	May 84.1309	Jun 80.5509	Jul 80.5509	Aug 84.1309	Sep 87.7110	Oct 91.2910	Nov 94.8710	Dec 98.4511 (44)
Energy conte	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Energy content (annual)												Total = Sum(45)m = 1408.1991 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	(56)
If cylinder contains dedicated solar storage													
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	(59)
Total heat required for water heating calculated for each month													
201.2769	177.6201	187.0442	168.3717	165.5050	148.6122	143.4181	156.4202	155.8451	174.5575	183.6979	196.6701	196.6701	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
201.2769	177.6201	187.0442	168.3717	165.5050	148.6122	143.4181	156.4202	155.8451	174.5575	183.6979	196.6701	196.6701	(64)
Heat gains from water heating, kWh/month													
92.7665	82.3997	88.0341	80.9919	80.8723	74.4219	73.5284	77.8516	76.8268	83.8823	86.0878	91.2347	91.2347	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
18.3088	16.2617	13.2249	10.0121	7.4842	6.3185	6.8273	8.8744	11.9112	15.1240	17.6520	18.8177	18.8177	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078	196.3078	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	(71)
Water heating gains (Table 5)													
124.6861	122.6187	118.3254	112.4887	108.6993	103.3637	98.8285	104.6393	106.7039	112.7450	119.5664	122.6273	122.6273	(72)
Total internal gains													
406.2912	404.3077	391.6074	371.1252	350.3761	330.3110	317.2233	322.9500	333.4217	354.1083	377.8894	395.6798	395.6798	(73)

6. Solar gains

[Jan]				Area	Solar flux	g		FF		Access		Gains	
				m2	Table 6a	Specific data		Specific data		factor		W	
					W/m2	or Table 6b		or Table 6c		Table 6d			
Southeast				6.2400	36.7938	0.4000		0.8000		0.7700		50.9147 (77)	
South				2.2100	46.7521	0.4000		0.8000		0.7700		22.9127 (78)	
Southwest				6.4700	36.7938	0.4000		0.8000		0.7700		52.7913 (79)	
West				1.9700	19.6403	0.4000		0.8000		0.7700		8.5802 (80)	

Solar gains	135.1989	230.9594	317.1420	393.8166	441.1436	437.7689	422.1475	387.0003	343.7915	255.6263	162.0737	115.6053	(83)
Total gains	541.4900	635.2671	708.7494	764.9418	791.5197	768.0799	739.3708	709.9503	677.2132	609.7345	539.9631	511.2851	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	95.0793	95.4228	95.7689	97.5375	97.8991	99.7480	99.7480	100.1262	99.0001	97.8991	97.1786	96.4686
alpha	7.3386	7.3615	7.3846	7.5025	7.5266	7.6499	7.6499	7.6751	7.6000	7.5266	7.4786	7.4312
util living area	0.9901	0.9697	0.9153	0.7847	0.6067	0.4261	0.3046	0.3303	0.5236	0.8250	0.9705	0.9930 (86)
MIT	20.5012	20.6604	20.8279	20.9541	20.9934	20.9996	21.0000	21.0000	20.9982	20.9454	20.7138	20.4713 (87)
Th 2	20.3141	20.3164	20.3187	20.3303	20.3326	20.3442	20.3442	20.3465	20.3395	20.3326	20.3279	20.3233 (88)
util rest of house	0.9873	0.9621	0.8970	0.7514	0.5652	0.3826	0.2592	0.2834	0.4743	0.7881	0.9617	0.9910 (89)
MIT 2	19.6551	19.8834	20.1141	20.2824	20.3269	20.3440	20.3442	20.3465	20.3383	20.2776	19.9709	19.6196 (90)
Living area fraction												
MIT	19.9663	20.1692	20.3766	20.5294	20.5720	20.5851	20.5854	20.5868	20.5810	20.5232	20.2442	19.9329 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9663	20.1692	20.3766	20.5294	20.5720	20.5851	20.5854	20.5868	20.5810	20.5232	20.2442	19.9329 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9856	0.9602	0.8987	0.7616	0.5802	0.3986	0.2759	0.3007	0.4924	0.7991	0.9604	0.9895	(94)
Useful gains	533.6830	610.0093	636.9698	582.5865	459.2720	306.1818	203.9819	213.4770	333.4428	487.2537	518.6047	505.9342	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
841.2451	816.9694	739.7784	608.7372	462.6861	306.3445	203.9897	213.4917	334.2351	517.5058	690.5667	832.6546	832.6546	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
228.8262	139.0771	76.4896	18.8285	2.5400	0.0000	0.0000	0.0000	0.0000	0.0000	22.5076	123.8126	243.0800	(98)
Space heating													855.1617 (98)
Space heating per m2													11.6317 (99)
													(98) / (4) =

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	855.1617 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	897.9198 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2059.0388 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2161.9908 (310a)
Electricity used for heat distribution	30.5991 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	170.9800 (330a)
Total electricity for the above, kWh/year	170.9800 (331)
Electricity for lighting (calculated in Appendix L)	323.3395 (332)
Total delivered energy for all uses	3554.2300 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3418.8945	0.2160	738.4812 (367)
Electrical energy for heat distribution	30.5991	0.5190	15.8809 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			754.3621 (373)
Space and water heating			754.3621 (376)
Pumps and fans	170.9800	0.5190	88.7386 (378)
Energy for lighting	323.3395	0.5190	167.8132 (379)
Total CO2, kg/year			1010.9139 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			13.7500 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		13.7500 ZC1
Total Floor Area	TFA	73.5200
Assumed number of occupants	N	2.3285
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.5530 ZC2
CO2 emissions from cooking, equation (L16)		2.3787 ZC3
Total CO2 emissions		32.6817 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		32.6817 ZC8

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1632 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4132 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3512 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4478	0.4390	0.4303	0.3864	0.3776	0.3337	0.3337	0.3249	0.3512	0.3776	0.3951	0.4127 (22b)
	0.6003	0.5964	0.5926	0.5746	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			16.4900	1.3258	21.8617			(27)					
External Wall	52.9300	16.4900	36.4400	0.1800	6.5592			(29a)					
Corridor	5.4000	1.8900	3.5100	0.1800	0.6318			(29a)					
Total net area of external elements Aum(A, m2)			58.3300					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.9427			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								6.8612 (36)					
Total fabric heat loss						(33) + (36) =		37.8039 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 36.4091	Feb 36.1729	Mar 35.9414	Apr 34.8541	May 34.6506	Jun 33.7036	Jul 33.7036	Aug 33.5282	Sep 34.0684	Oct 34.6506	Nov 35.0622	Dec 35.4924	(38)
Heat transfer coeff	74.2130	73.9768	73.7454	72.6580	72.4546	71.5075	71.5075	71.3322	71.8723	72.4546	72.8661	73.2964	(39)
Average = Sum(39)m / 12 =												72.6570	(39)
HLP	Jan 1.0094	Feb 1.0062	Mar 1.0031	Apr 0.9883	May 0.9855	Jun 0.9726	Jul 0.9726	Aug 0.9702	Sep 0.9776	Oct 0.9855	Nov 0.9911	Dec 0.9970	(40)
HLP (average)												0.9883	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy conte	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Energy content (annual)										Total = Sum(45)m =		1408.1991 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
	85.8210	76.1264	81.0886	74.2704	73.9268	67.7004	66.5829	70.9061	70.1053	76.9367	79.3664	84.2892 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3070	16.2601	13.2236	10.0111	7.4834	6.3178	6.8266	8.8735	11.9100	15.1225	17.6502	18.8158	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	(71)
Water heating gains (Table 5)	115.3508	113.2833	108.9900	103.1533	99.3640	94.0283	89.4931	95.3039	97.3685	103.4096	110.2311	113.2919	(72)
Total internal gains	399.9539	397.9707	385.2706	364.7888	344.0400	323.9750	310.8872	316.6137	327.0851	347.7714	371.5522	389.3425	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Southeast				6.0900	36.7938	0.6300	0.7000	0.7700	68.4801 (77)			
South				2.1600	46.7521	0.6300	0.7000	0.7700	30.8622 (78)			
Southwest				6.3200	36.7938	0.6300	0.7000	0.7700	71.0663 (79)			
West				1.9200	19.6403	0.6300	0.7000	0.7700	11.5245 (80)			
Solar gains	181.9330	310.7877	426.7420	529.8924	593.5562	589.0095	567.9937	520.7143	462.5933	343.9756	218.0963	155.5675 (83)
Total gains	581.8870	708.7584	812.0126	894.6812	937.5962	912.9845	878.8809	837.3280	789.6784	691.7470	589.6485	544.9100 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.7960	69.0156	69.2322	70.2683	70.4656	71.3988	71.3988	71.5744	71.0365	70.4656	70.0676	69.6563	
alpha	5.5864	5.6010	5.6155	5.6846	5.6977	5.7599	5.7599	5.7716	5.7358	5.6977	5.6712	5.6438	
util living area	0.9922	0.9771	0.9388	0.8429	0.6841	0.4965	0.3574	0.3908	0.6111	0.8845	0.9800	0.9944	(86)
MIT	20.1321	20.3461	20.5971	20.8354	20.9573	20.9943	20.9993	20.9988	20.9824	20.8135	20.4278	20.0939	(87)
Th 2	20.0755	20.0782	20.0808	20.0931	20.0954	20.1062	20.1062	20.1082	20.1021	20.0954	20.0908	20.0859	(88)
util rest of house	0.9898	0.9706	0.9223	0.8070	0.6283	0.4293	0.2851	0.3156	0.5384	0.8484	0.9731	0.9926	(89)
MIT 2	18.9334	19.2425	19.5953	19.9172	20.0584	20.1028	20.1060	20.1078	20.0901	19.9004	19.3725	18.8859	(90)
Living area fraction	19.3743	19.6484	19.9637	20.2549	20.3890	20.4307	20.4345	20.4355	20.4182	20.2362	19.7606	19.3302	(91)
MIT	19.3743	19.6484	19.9637	20.2549	20.3890	20.4307	20.4345	20.4355	20.4182	20.2362	19.7606	19.3302	(92)
Temperature adjustment	19.3743	19.6484	19.9637	20.2549	20.3890	20.4307	20.4345	20.4355	20.4182	20.2362	19.7606	19.3302	(93)
adjusted MIT	19.3743	19.6484	19.9637	20.2549	20.3890	20.4307	20.4345	20.4355	20.4182	20.2362	19.7606	19.3302	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9874	0.9668	0.9199	0.8139	0.6470	0.4539	0.3117	0.3433	0.5646	0.8546	0.9700	0.9907	(94)
Ext temp.	574.5418	685.2257	747.0076	728.1608	606.5812	414.4448	273.9663	287.4611	445.8306	591.1723	571.9475	539.8407	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1118.7057	1091.0408	992.8858	825.0249	629.5572	416.9375	274.1965	287.8594	454.1064	698.1865	922.5305	1108.9889	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	404.8580	272.7078	182.9334	69.7421	17.0941	0.0000	0.0000	0.0000	0.0000	79.6186	252.4197	423.4462	(98)
Space heating per m2												1702.8199	(98)
										(98) / (4) =		23.1613	(99)

8c. Space cooling requirement

Not applicable

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1821.1977 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	404.8580	272.7078	182.9334	69.7421	17.0941	0.0000	0.0000	0.0000	0.0000	79.6186	252.4197	423.4462	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	433.0032	291.6660	195.6507	74.5905	18.2825	0.0000	0.0000	0.0000	0.0000	85.1536	269.9676	452.8836	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882	(64)
Efficiency of water heater (217)m	86.7503	86.0718	84.8813	82.7712	80.7383	79.8000	79.8000	79.8000	79.8000	82.9819	85.7857	86.9168	(216)
Fuel for water heating, kWh/month	222.0107	197.2519	210.1313	193.2676	194.2364	175.7022	168.8423	185.1357	184.7660	199.8936	204.3417	216.2851	(219)
Water heating fuel used												2351.8646	(219)
Annual totals kWh/year													
Space heating fuel - main system												1821.1977	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												323.3067	(232)
Total delivered energy for all uses												4571.3691	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1821.1977	0.2160	393.3787 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2351.8646	0.2160	508.0028 (264)
Space and water heating			901.3815 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	323.3067	0.5190	167.7962 (268)
Total CO2, kg/m2/year			1108.1027 (272)
Emissions per m2 for space and water heating			12.2604 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2823 (272b)
Emissions per m2 for pumps and fans			0.5294 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.2604 * 1.00) + 2.2823 + 0.5294, rounded to 2 d.p.			15.0700 (273)

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Calculation Type: New Build (As Designed)

Property Reference	084	Issued on Date	29/04/2022
Assessment Reference	084	Prop Type Ref	
Property			
SAP Rating	84 B	DER	17.28
Environmental	87 B	TER	18.67
CO ₂ Emissions (t/year)	1.03	% DER<TER	7.47
General Requirements Compliance	Pass	DFEE	45.83
		TFEE	53.07
		% DFEE<TFEE	13.64
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.67 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.28 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)53.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)45.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK
Based on:
Overshading: Average
Windows facing West: 5.93 m², No overhang
Windows facing North West: 7.10 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							2	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1275 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			13.0300	1.1450	14.9198		(27)					
External Wall	35.0800	13.0300	22.0500	0.1500	3.3075		(29a)					
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)					
Core	18.2300		18.2300	0.2500	4.5575		(29a)					
Main Roof	72.7700		72.7700	0.1000	7.2770		(30)					
Total net area of external elements Aum(A, m2)			143.5800				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		35.8543		(33)					
Party Wall 1			18.3000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												
								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								10.2164 (36)				
Total fabric heat loss								(33) + (36) = 46.0707 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 17.0688	Feb 16.8774	Mar 16.6860	Apr 15.7292	May 15.5379	Jun 14.5811	Jul 14.5811	Aug 14.3897	Sep 14.9638	Oct 15.5379	Nov 15.9206	Dec 16.3033 (38)
Heat transfer coeff	63.1395	62.9482	62.7568	61.8000	61.6086	60.6518	60.6518	60.4604	61.0345	61.6086	61.9913	62.3741 (39)
Average = Sum(39)m / 12 =												61.7521 (39)
HLP	Jan 0.8677	Feb 0.8650	Mar 0.8624	Apr 0.8493	May 0.8466	Jun 0.8335	Jul 0.8335	Aug 0.8308	Sep 0.8387	Oct 0.8466	Nov 0.8519	Dec 0.8571 (40)
HLP (average)												0.8486 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	Jan 98.0067	Feb 94.4428	Mar 90.8789	Apr 87.3151	May 83.7512	Jun 80.1873	Jul 80.1873	Aug 83.7512	Sep 87.3151	Oct 90.8789	Nov 94.4428	Dec 98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)												Total = Sum(45)m = 1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)
Water storage loss:											
Store volume											110.0000 (47)
b) If manufacturer declared loss factor is not known :											
Hot water storage loss factor from Table 2 (kWh/litre/day)											0.0152 (51)
Volume factor from Table 2a											1.0294 (52)
Temperature factor from Table 2b											0.6000 (53)
Enter (49) or (54) in (55)											1.0327 (55)
Total storage loss											
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage											
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month											
200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =											0.0000 (63)
Output from w/h											
200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319 (64)
Total per year (kWh/year) = Sum(64)m =											2052.6825 (64)
Heat gains from water heating, kWh/month											
92.5474	82.2081	87.8363	80.8195	80.7069	74.2791	73.3961	77.6998	76.6732	83.7032	85.8924	91.0225 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5											
18.2451	16.2051	13.1789	9.9773	7.4581	6.2965	6.8035	8.8435	11.8697	15.0713	17.5905	18.7521 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											
203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573 (69)
Pumps, fans											
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)											
-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581 (71)
Water heating gains (Table 5)											
124.3916	122.3335	118.0596	112.2492	108.4770	103.1654	98.6507	104.4353	106.4905	112.5044	119.2950	122.3421 (72)
Total internal gains											
403.9823	401.9977	389.3716	369.0214	348.4174	328.4923	315.4981	321.2091	331.6165	352.1703	375.7927	393.4532 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
	m2	Table 6a	or Table 6b	Specific data or Table 6c	factor Table 6d	W
West	5.9300	19.6403	0.4000	0.8000	0.7700	25.8277 (80)
Northwest	7.1000	11.2829	0.4000	0.8000	0.7700	17.7649 (81)
Solar gains						
43.5926	86.6855	148.3572	228.3479	292.5450	305.5740	288.3795
Total gains						
447.5749	488.6831	537.7288	597.3693	640.9623	634.0663	603.8776

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)											
Utilisation factor for gains for living area, nil,m (see Table 9a)											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.0366	80.2799	80.5247	81.7714	82.0254	83.3194	83.3194	83.5831	82.7969	82.0254	81.5190
alpha	6.3358	6.3520	6.3683	6.4514	6.4684	6.5546	6.5546	6.5722	6.5198	6.4684	6.4346
util living area											
0.9975	0.9949	0.9853	0.9419	0.8130	0.6024	0.4408	0.4941	0.7740	0.9652	0.9942	0.9980 (86)
MIT											
20.1728	20.2823	20.4823	20.7472	20.9291	20.9915	20.9990	20.9981	20.9616	20.7264	20.4080	20.1554 (87)
Th 2											
20.1951	20.1973	20.1996	20.2109	20.2131	20.2244	20.2244	20.2267	20.2199	20.2131	20.2086	20.2041 (88)
util rest of house											
0.9967	0.9933	0.9805	0.9235	0.7659	0.5337	0.3637	0.4124	0.7064	0.9504	0.9921	0.9974 (89)
MIT 2											
19.0841	19.2453	19.5364	19.9162	20.1460	20.2189	20.2240	20.2259	20.1902	19.8959	19.4377	19.0656 (90)
Living area fraction											
19.5030	19.6443	19.9003	20.2360	20.4473	20.5162	20.5222	20.5230	20.4870	20.2154	19.8110	19.4850 (92)
Temperature adjustment											
19.5030	19.6443	19.9003	20.2360	20.4473	20.5162	20.5222	20.5230	20.4870	20.2154	19.8110	19.4850 (93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9957	0.9919	0.9783	0.9242	0.7807	0.5600	0.3934	0.4439	0.7308	0.9505	0.9967 (94)
Useful gains	445.6679	484.7140	526.0565	552.0783	500.4239	355.0461	237.5692	248.5994	371.1031	433.7197	427.7704 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000
Heat loss rate W											
959.9096	928.1261	840.9616	700.5624	538.9104	358.8285	237.8909	249.2776	389.8277	592.3935	787.9737	953.3848 (97)
Month fracti											
1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh											
382.5959	297.9729	234.2894	106.9086	28.6340	0.0000	0.0000	0.0000	0.0000	118.0533	260.3909	391.0571 (98)
Space heating											
Space heating per m2											
(98) / (4) =											25.0090 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	1819.9020	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1910.8971	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating:		
Annual water heating requirement	2052.6825	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2155.3166	(310a)
Electricity used for heat distribution	40.6621	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)		
mechanical ventilation fans (SFP = 0.7625)	169.2357	(330a)
Total electricity for the above, kWh/year	169.2357	(331)
Electricity for lighting (calculated in Appendix L)	322.2135	(332)
Total delivered energy for all uses	4557.6629	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	4543.2555	0.2160	981.3432 (367)
Electrical energy for heat distribution	40.6621	0.5190	21.1036 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1002.4468 (373)
Space and water heating			1002.4468 (376)
Pumps and fans	169.2357	0.5190	87.8333 (378)
Energy for lighting	322.2135	0.5190	167.2288 (379)
Total CO2, kg/year			1257.5090 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			17.2800 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		17.2800	ZC1
Total Floor Area	TFA	72.7700	
Assumed number of occupants	N	2.3115	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.5855	ZC2
CO2 emissions from cooking, equation (L16)		2.3976	ZC3
Total CO2 emissions		36.2631	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		36.2631	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					30.0000 / (5) = 0.1649 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4149 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3527 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4497	0.4408	0.4320	0.3879	0.3791	0.3350	0.3350	0.3262	0.3527	0.3791	0.3968	0.4144 (22b)
	0.6011	0.5972	0.5933	0.5752	0.5719	0.5561	0.5561	0.5532	0.5622	0.5719	0.5787	0.5859 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900			(26)				
TER Opening Type (Uw = 1.40)			13.0300	1.3258	17.2746			(27)				
External Wall	35.0800	13.0300	22.0500	0.1800	3.9690			(29a)				
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098			(29a)				
Core	18.2300		18.2300	0.1800	3.2814			(29a)				
Main Roof	72.7700		72.7700	0.1300	9.4601			(30)				
Total net area of external elements Aum(A, m2)			143.5800					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	38.6849			(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								8.0954 (36)				
Total fabric heat loss						(33) + (36) =		46.7803 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 36.0868	Feb 35.8511	Mar 35.6201	Apr 34.5351	May 34.3321	Jun 33.3870	Jul 33.3870	Aug 33.2120	Sep 33.7511	Oct 34.3321	Nov 34.7427	Dec 35.1721 (38)
Heat transfer coeff	82.8671	82.6314	82.4004	81.3154	81.1124	80.1674	80.1674	79.9924	80.5314	81.1124	81.5231	81.9524 (39)
Average = Sum(39)m / 12 =												81.3144 (39)
HLP	Jan 1.1388	Feb 1.1355	Mar 1.1323	Apr 1.1174	May 1.1146	Jun 1.1017	Jul 1.1017	Aug 1.0992	Sep 1.1067	Oct 1.1146	Nov 1.1203	Dec 1.1262 (40)
HLP (average)												1.1174 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)										Total = Sum(45)m =		1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (64)
Heat gains from water heating, kWh/month	85.6018	75.9347	80.8908	74.0980	73.7613	67.5576	66.4506	70.7543	69.9517	76.7577	79.1709	84.0770 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5611	16.4858	13.4072	10.1501	7.5873	6.4055	6.9214	8.9967	12.0753	15.3324	17.8952	19.0770	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	(71)
Water heating gains (Table 5)	115.0562	112.9981	108.7242	102.9139	99.1416	93.8300	89.3153	95.0999	97.1551	103.1690	109.9597	113.0067	(72)
Total internal gains	397.9629	395.9430	383.2645	362.8588	342.2112	322.2660	309.2806	315.0269	325.4868	346.0960	369.7620	387.4427	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
West					5.9300	19.6403	0.6300	0.7000			0.7700			35.5938 (80)
Northwest					7.1000	11.2829	0.6300	0.7000			0.7700			24.4823 (81)
Solar gains	60.0761	119.4634	204.4548	314.6920	403.1636	421.1192	397.4230	329.1693	242.7702	143.5223	75.1863			49.2641 (83)
Total gains	458.0390	515.4064	587.7193	677.5508	745.3747	743.3852	706.7036	644.1963	568.2570	489.6183	444.9483			436.7067 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	60.9829	61.1568	61.3282	62.1466	62.3021	63.0365	63.0365	63.1744	62.7516	62.3021	61.9883	61.6635
alpha	5.0655	5.0771	5.0885	5.1431	5.1535	5.2024	5.2024	5.2116	5.1834	5.1535	5.1326	5.1109
util living area	0.9975	0.9950	0.9861	0.9491	0.8425	0.6557	0.4923	0.5576	0.8287	0.9736	0.9950	0.9981 (86)
MIT	19.8012	19.9421	20.2034	20.5575	20.8358	20.9666	20.9937	20.9885	20.8898	20.5235	20.1041	19.7803 (87)
Th 2	19.9693	19.9719	19.9745	19.9866	19.9889	19.9995	19.9995	20.0014	19.9954	19.9889	19.9843	19.9795 (88)
util rest of house	0.9967	0.9933	0.9811	0.9308	0.7914	0.5672	0.3840	0.4435	0.7548	0.9608	0.9929	0.9974 (89)
MIT 2	18.3746	18.5819	18.9625	19.4717	19.8321	19.9780	19.9972	19.9968	19.9080	19.4350	18.8277	18.3514 (90)
Living area fraction	18.9235	19.1053	19.4399	19.8895	20.2183	20.3584	20.3807	20.3784	20.2858	fLA = Living area / (4) =	19.3188	0.3848 (91)
MIT	18.9235	19.1053	19.4399	19.8895	20.2183	20.3584	20.3807	20.3784	20.2858	19.8538	19.3188	18.9012 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9235	19.1053	19.4399	19.8895	20.2183	20.3584	20.3807	20.3784	20.2858	19.8538	19.3188	18.9012 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	455.9710	510.9480	574.6405	629.2774	599.3967	446.1582	300.9581	314.1101	442.3919	469.3250	440.9855	435.1469	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1211.8061	1173.8001	1066.2558	893.6129	690.9404	461.6363	303.0852	318.2430	498.1498	750.5981	996.1154	1204.7996	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	562.3413	445.4366	365.7618	190.3216	68.1085	0.0000	0.0000	0.0000	0.0000	209.2672	399.6935	572.6216	(98)
Space heating												2813.5522	(98)
Space heating per m ²												38.6636	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3009.1467 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	562.3413	445.4366	365.7618	190.3216	68.1085	0.0000	0.0000	0.0000	0.0000	209.2672	399.6935	572.6216	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	601.4346	476.4028	391.1891	203.5525	72.8434	0.0000	0.0000	0.0000	0.0000	223.8152	427.4797	612.4296	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500	(64)
Efficiency of water heater (217)m	87.5140	87.2784	86.6979	85.2868	82.7697	79.8000	79.8000	79.8000	79.8000	85.4434	86.9538	87.6042	(216)
Fuel for water heating, kWh/month	219.3202	193.8647	205.0423	186.9589	188.8679	175.1642	168.3438	184.5636	184.1870	193.5049	200.9209	213.8595	(219)
Water heating fuel used												2314.5980	(219)
Annual totals kWh/year													
Space heating fuel - main system												3009.1467	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												327.7949	(232)
Total delivered energy for all uses												5726.5396	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3009.1467	0.2160	649.9757 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2314.5980	0.2160	499.9532 (264)
Space and water heating			1149.9289 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	327.7949	0.5190	170.1255 (268)
Total CO2, kg/m2/year			1358.9794 (272)
Emissions per m2 for space and water heating			15.8022 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3379 (272b)
Emissions per m2 for pumps and fans			0.5349 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.8022 * 1.00) + 2.3379 + 0.5349, rounded to 2 d.p.			18.6700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	089			Issued on Date	29/04/2022
Assessment Reference	089	Prop Type Ref			
Property					
SAP Rating	83 B	DER	17.32	TER	18.68
Environmental	89 B	% DER<TER	7.27		
CO ₂ Emissions (t/year)	0.75	DFEE	38.77	TFEE	42.55
General Requirements Compliance	Pass	% DFEE<TFEE	8.89		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 18.68 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 17.32 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)42.6 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)38.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing South East:	6.24 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)
External Wall	23.2500	8.4500	14.8000	0.1500	2.2200		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Main Roof	50.7900		50.7900	0.1000	5.0790		(30)
Total net area of external elements Aum(A, m ²)			91.5400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.7671		(33)
Party Wall 1			33.3000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.4438 (36)
Total fabric heat loss							(33) + (36) = 31.2109 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	11.1341	11.0123	10.8905	10.2816	10.1599	9.5510	9.5510	9.4292	9.7945	10.1599	10.4034	10.6470 (38)
Average = Sum(39)m / 12 =	42.3450	42.2232	42.1014	41.4925	41.3707	40.7619	40.7619	40.6401	41.0054	41.3707	41.6143	41.8578 (39)
												41.4621 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8337	0.8313	0.8289	0.8169	0.8145	0.8026	0.8026	0.8002	0.8074	0.8145	0.8193	0.8241 (40)
Days in month												0.8163 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy content (annual)	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1178.3544 (45)
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
	Solar input (sum of months) = Sum (63)m =											0.0000 (63)	
Output from w/h													
	177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(64)
	Total per year (kWh/year) = Sum (64)m =											1829.1942 (64)	
Heat gains from water heating, kWh/month													
	84.8430	75.4698	80.8830	74.7574	74.8902	69.2597	68.7450	72.3625	71.2721	77.4089	79.0216	83.5613	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.4839	11.9763	9.7398	7.3736	5.5119	4.6534	5.0281	6.5357	8.7723	11.1384	13.0002	13.8587 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	114.0363	112.3063	108.7138	103.8297	100.6589	96.1941	92.3992	97.2615	98.9891	104.0442	109.7522	112.3135 (72)
Total internal gains	325.5065	323.8179	314.0852	298.5244	283.0012	267.8182	257.8112	262.6320	270.4999	286.2317	304.2921	317.5716 (73)

[Jan				Area	Solar flux	g		FF	Access		Gains	
				m2	Table 6a	Table 6b		Table 6c	factor		W	
					W/m2	or		or	Table 6d			
Southeast				6.2400	36.7938	0.4000		0.8000	0.7700		50.9147 (77)	
South				2.2100	46.7521	0.4000		0.8000	0.7700		22.9127 (78)	
Solar gains	73.8274	124.2516	166.4633	201.0539	220.9821	217.6723	210.5612	195.8614	178.4200	136.3256	88.1434	63.3710 (83)
Total gains	399.3338	448.0695	480.5485	499.5783	503.9832	485.4906	468.3724	458.4934	448.9198	422.5573	392.4355	380.9426 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil/m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	83.2941	83.5343	83.7759	85.0053	85.2555	86.5290	86.5290	86.7883	86.0151	85.2555	84.7565	84.2634
alpha	6.5529	6.5690	6.5851	6.6670	6.6837	6.7686	6.7686	6.7859	6.7343	6.6837	6.6504	6.6176
util living area	0.9896	0.9770	0.9474	0.8717	0.7294	0.5336	0.3826	0.4072	0.6196	0.8776	0.9743	0.9920 (86)
MIT	20.3878	20.5249	20.6952	20.8690	20.9663	20.9964	20.9997	20.9995	20.9905	20.8830	20.6142	20.3605 (87)
Th 2	20.2242	20.2263	20.2283	20.2387	20.2407	20.2511	20.2511	20.2532	20.2470	20.2407	20.2366	20.2325 (88)
util rest of house	0.9866	0.9707	0.9337	0.8420	0.6802	0.4729	0.3177	0.3414	0.5564	0.8434	0.9662	0.9897 (89)
MIT 2	19.4186	19.6162	19.8564	20.0951	20.2104	20.2489	20.2510	20.2530	20.2403	20.1183	19.7539	19.3858 (90)
Living area fraction	19.9056	20.0728	20.2779	20.4839	20.5902	20.6245	20.6272	20.6281	20.6173	20.5025	20.1862	0.5025 (91)
MIT	19.9056	20.0728	20.2779	20.4839	20.5902	20.6245	20.6272	20.6281	20.6173	20.5025	20.1862	19.8755 (92)
Temperature adjustment	19.9056	20.0728	20.2779	20.4839	20.5902	20.6245	20.6272	20.6281	20.6173	20.5025	20.1862	0.0000
adjusted MIT	19.9056	20.0728	20.2779	20.4839	20.5902	20.6245	20.6272	20.6281	20.6173	20.5025	20.1862	19.8755 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9851	0.9692	0.9346	0.8522	0.7034	0.5033	0.3503	0.3745	0.5878	0.8560	0.9656	0.9883 (94)
Useful gains	393.3764	434.2852	449.1426	425.7289	354.5089	244.3591	164.0668	171.6920	263.8941	361.7090	378.9264	376.4983 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	660.8175	640.6421	580.0670	480.6463	367.7933	245.5688	164.1551	171.8297	267.2436	409.6738	544.5712	656.1438 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	198.9762	138.6719	97.4077	39.5405	9.8836	0.0000	0.0000	0.0000	0.0000	35.6858	119.2643	208.0562 (98)
Space heating												847.4861 (99)
Space heating per m2												16.6861 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	847.4861 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	889.8604 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1920.6539 (310a)
Electricity used for heat distribution	28.1051 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	238.1302 (332)
Total delivered energy for all uses	3170.6358 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3140.2394	0.2160	678.2917 (367)
Electrical energy for heat distribution	28.1051	0.5190	14.5866 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			692.8783 (373)
Space and water heating			692.8783 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	238.1302	0.5190	123.5896 (379)
Total CO2, kg/year			879.7813 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			17.3200 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		17.3200 ZC1
Total Floor Area	TFA	50.7900
Assumed number of occupants	N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.4175 ZC2
CO2 emissions from cooking, equation (L16)		3.1526 ZC3
Total CO2 emissions		37.8901 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		37.8901 ZC8

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 20.0000 / (5) = 0.1575 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4075 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
Effective ac	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)
External Wall	23.2500	8.4500	14.8000	0.1800	2.6640		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Main Roof	50.7900		50.7900	0.1300	6.6027		(30)
Total net area of external elements Aum(A, m ²)			91.5400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	25.1692	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.9994 (36)
Total fabric heat loss						(33) + (36) =	31.1686 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	24.3480	24.2160	24.0867	23.4794	23.3658	22.8368	22.8368	22.7389	23.0406	23.3658	23.5957	23.8360 (38)
Heat transfer coeff	55.5165	55.3846	55.2553	54.6480	54.5343	54.0054	54.0054	53.9074	54.2091	54.5343	54.7642	55.0045 (39)
Average = Sum(39)m / 12 =												54.6474 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0931	1.0905	1.0879	1.0760	1.0737	1.0633	1.0633	1.0614	1.0673	1.0737	1.0782	1.0830 (40)
HLP (average)												1.0759 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
Heat gains from water heating, kWh/month	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782 (72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415 (73)

6. Solar gains

[Jan]		Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W					
Southeast		6.2400	36.7938	0.6300	0.7000	0.7700	70.1668 (77)					
South		2.2100	46.7521	0.6300	0.7000	0.7700	31.5766 (78)					
Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains	421.2115	488.9806	537.3716	569.4289	581.3281	561.5651	541.7662	526.3621	510.2428	468.0154	419.7157	398.8747 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	63.5322	63.6835	63.8325	64.5419	64.6764	65.3098	65.3098	65.4285	65.0644	64.6764	64.4049	64.1235
alpha	5.2355	5.2456	5.2555	5.3028	5.3118	5.3540	5.3540	5.3619	5.3376	5.3118	5.2937	5.2749
util living area	0.9912	0.9802	0.9560	0.8970	0.7791	0.5970	0.4356	0.4667	0.6897	0.9103	0.9803	0.9932 (86)
MIT	20.0478	20.2291	20.4624	20.7180	20.8982	20.9805	20.9969	20.9956	20.9585	20.7354	20.3447	20.0118 (87)
Th 2	20.0065	20.0086	20.0107	20.0205	20.0224	20.0309	20.0309	20.0325	20.0276	20.0224	20.0186	20.0148 (88)
util rest of house	0.9884	0.9743	0.9429	0.8674	0.7226	0.5145	0.3413	0.3709	0.6089	0.8781	0.9734	0.9911 (89)
MIT 2	18.7596	19.0219	19.3537	19.7081	19.9295	20.0188	20.0298	20.0308	19.9983	19.7398	19.1983	18.7136 (90)
Living area fraction	19.4068	19.6285	19.9108	20.2155	20.4162	20.5020	20.5158	20.5156	20.4808	20.2401	19.7743	0.5025 (91)
MIT	19.4068	19.6285	19.9108	20.2155	20.4162	20.5020	20.5158	20.5156	20.4808	20.2401	19.7743	19.3659 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4068	19.6285	19.9108	20.2155	20.4162	20.5020	20.5158	20.5156	20.4808	20.2401	19.7743	19.3659 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	415.4360	475.0410	505.8674	497.6151	433.9755	311.9106	210.6332	220.6063	330.6056	414.7359	407.6342	394.5852 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	838.6788	815.7306	741.0165	618.3709	475.3347	318.7419	211.4727	221.8605	345.8954	525.7142	694.0989	834.1923 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	314.8926	228.9434	174.9510	86.9441	30.7713	0.0000	0.0000	0.0000	0.0000	82.5679	206.2546	327.0677 (98)
Space heating												1452.3925 (98)
Space heating per m2										(98) / (4) =		28.5960 (99)

8c. Space cooling requirement

Not applicable

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1553.3610 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	314.8926	228.9434	174.9510	86.9441	30.7713	0.0000	0.0000	0.0000	0.0000	82.5679	206.2546	327.0677	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	336.7836	244.8592	187.1133	92.9884	32.9105	0.0000	0.0000	0.0000	0.0000	88.3079	220.5931	349.8050	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	86.4550	85.9573	85.1055	83.5649	81.5493	79.8000	79.8000	79.8000	79.8000	83.3537	85.5932	86.6074	(217)
Fuel for water heating, kWh/month	195.2056	173.2680	184.3070	168.9939	170.2427	156.2471	150.8144	164.4484	163.8315	175.6451	179.9726	190.4111	(219)
Water heating fuel used												2073.3874	(219)
Annual totals kWh/year													
Space heating fuel - main system												1553.3610	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												3945.1247	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1553.3610	0.2160	335.5260 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2073.3874	0.2160	447.8517 (264)
Space and water heating			783.3776 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			948.6150 (272)
Emissions per m2 for space and water heating			15.4239 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.4239 * 1.00) + 2.4870 + 0.7664, rounded to 2 d.p.			18.6800 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	090				Issued on Date	29/04/2022
Assessment Reference	090		Prop Type Ref			
Property						
SAP Rating	84 B	DER	15.61	TER	16.93	
Environmental	88 B	% DER<TER	7.81			
CO ₂ Emissions (t/year)	0.96	DFEE	38.88	TFEE	45.08	
General Requirements Compliance	Fail	% DFEE<TFEE	13.77			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 74 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.93 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.61 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)45.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)38.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing South East: 6.24 m², No overhang
Windows facing South: 2.21 m², No overhang
Windows facing South West: 6.47 m², No overhang
Windows facing West: 1.97 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												75.6500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			16.8900	1.1450	19.3397		(27)
External Wall	52.9300	16.8900	36.0400	0.1500	5.4060		(29a)
Corridor	5.4000	1.8900	3.5100	0.2500	0.8775		(29a)
Main Roof	73.5200		73.5200	0.1000	7.3520		(30)
Total net area of external elements Aum(A, m ²)			131.8500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.8652		(33)
Party Wall 1			34.6500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.7998 (36)
Total fabric heat loss							(33) + (36) = 46.6650 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	17.2447	17.0514	16.8580	15.8913	15.6980	14.7313	14.7313	14.5380	15.1180	15.6980	16.0847	16.4714 (38)
Average = Sum(39)m / 12 =	63.9097	63.7164	63.5230	62.5563	62.3630	61.3963	61.3963	61.2030	61.7830	62.3630	62.7497	63.1363 (39)
												62.5080 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8693	0.8667	0.8640	0.8509	0.8482	0.8351	0.8351	0.8325	0.8404	0.8482	0.8535	0.8588 (40)
Days in month												0.8502 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy content (annual)	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1408.1991 (45)
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	201.2769	177.6201	187.0442	168.3717	165.5050	148.6122	143.4181	156.4202	155.8451	174.5575	183.6979	196.6701	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
	Solar input (sum of months) = Sum (63)m =											0.0000 (63)	
Output from w/h													
	201.2769	177.6201	187.0442	168.3717	165.5050	148.6122	143.4181	156.4202	155.8451	174.5575	183.6979	196.6701	(64)
	Total per year (kWh/year) = Sum (64)m =											2059.0388 (64)	
Heat gains from water heating, kWh/month													
	92.7665	82.3997	88.0341	80.9919	80.8723	74.4219	73.5284	77.8516	76.8268	83.8823	86.0878	91.2347	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3088	16.2617	13.2249	10.0121	7.4842	6.3185	6.8273	8.8744	11.9112	15.1240	17.6520	18.8177 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385 (71)
Water heating gains (Table 5)	124.6861	122.6187	118.3254	112.4887	108.6993	103.3637	98.8285	104.6393	106.7039	112.7450	119.5664	122.6273 (72)
Total internal gains	406.2912	404.3077	391.6074	371.1252	350.3761	330.3110	317.2233	322.9500	333.4217	354.1083	377.8894	395.6798 (73)

[Jan	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Southeast	6.2400	36.7938	0.4000	0.8000	0.7700	50.9147 (77)
South	2.2100	46.7521	0.4000	0.8000	0.7700	22.9127 (78)
Southwest	6.4700	36.7938	0.4000	0.8000	0.7700	52.7913 (79)
West	1.9700	19.6403	0.4000	0.8000	0.7700	8.5802 (80)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9894	0.9731	0.9337	0.8360	0.6702	0.4703	0.3244	0.3540	0.5762	0.8649	0.9736	0.9921 (94)
Useful gains	535.7259	618.1856	661.7719	639.4606	530.4788	361.2115	239.8705	251.3578	390.2042	527.3544	525.7162	507.2562 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	979.7936	952.5560	864.6373	716.9041	547.0920	362.6258	239.9733	251.5373	395.2363	608.2999	806.9266	971.9610 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	330.3863	224.6969	150.9319	55.7593	12.3602	0.0000	0.0000	0.0000	0.0000	60.2235	202.4715	345.7404 (98)
Space heating												1382.5700 (98)
Space heating per m2										(98) / (4) =		18.8054 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1382.5700 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1451.6985 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2059.0388 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2161.9908 (310a)
Electricity used for heat distribution	36.1369 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	170.9800 (330a)
Total electricity for the above, kWh/year	170.9800 (331)
Electricity for lighting (calculated in Appendix L)	323.3395 (332)
Total delivered energy for all uses	4108.0087 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	4037.6417	0.2160	872.1306 (367)
Electrical energy for heat distribution	36.1369	0.5190	18.7550 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			890.8856 (373)
Space and water heating			890.8856 (376)
Pumps and fans	170.9800	0.5190	88.7386 (378)
Energy for lighting	323.3395	0.5190	167.8132 (379)
Total CO2, kg/year			1147.4374 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.6100 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		15.6100 ZC1
Total Floor Area	TFA	73.5200
Assumed number of occupants	N	2.3285
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.5530 ZC2
CO2 emissions from cooking, equation (L16)		2.3787 ZC3
Total CO2 emissions		34.5417 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		34.5417 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1632 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4132 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3512 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4478	0.4390	0.4303	0.3864	0.3776	0.3337	0.3337	0.3249	0.3512	0.3776	0.3951	0.4127 (22b)
	0.6003	0.5964	0.5926	0.5746	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			16.4900	1.3258	21.8617		(27)
External Wall	52.9300	16.4900	36.4400	0.1800	6.5592		(29a)
Corridor	5.4000	1.8900	3.5100	0.1800	0.6318		(29a)
Main Roof	73.5200		73.5200	0.1300	9.5576		(30)
Total net area of external elements Aum(A, m ²)			131.8500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.5003		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.7577 (36)
Total fabric heat loss						(33) + (36) =	49.2580 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.4091	36.1729	35.9414	34.8541	34.6506	33.7036	33.7036	33.5282	34.0684	34.6506	35.0622	35.4924 (38)
Heat transfer coeff	85.6671	85.4309	85.1995	84.1121	83.9087	82.9616	82.9616	82.7863	83.3264	83.9087	84.3202	84.7505 (39)
Average = Sum(39)m / 12 =												84.1111 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1652	1.1620	1.1589	1.1441	1.1413	1.1284	1.1284	1.1260	1.1334	1.1413	1.1469	1.1528 (40)
HLP (average)												1.1441 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy conte	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Energy content (annual)										Total = Sum(45)m =		1408.1991 (45)
Distribution loss (46)m = 0.15 x (45)m	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
Heat gains from water heating, kWh/month	85.8210	76.1264	81.0886	74.2704	73.9268	67.7004	66.5829	70.9061	70.1053	76.9367	79.3664	84.2892 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3070	16.2601	13.2236	10.0111	7.4834	6.3178	6.8266	8.8735	11.9100	15.1225	17.6502	18.8158	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	(71)
Water heating gains (Table 5)	115.3508	113.2833	108.9900	103.1533	99.3640	94.0283	89.4931	95.3039	97.3685	103.4096	110.2311	113.2919	(72)
Total internal gains	399.9539	397.9707	385.2706	364.7888	344.0400	323.9750	310.8872	316.6137	327.0851	347.7714	371.5522	389.3425	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d	Gains W			
Southeast				6.0900	36.7938	0.6300	0.7000		0.7700	68.4801 (77)			
South				2.1600	46.7521	0.6300	0.7000		0.7700	30.8622 (78)			
Southwest				6.3200	36.7938	0.6300	0.7000		0.7700	71.0663 (79)			
West				1.9200	19.6403	0.6300	0.7000		0.7700	11.5245 (80)			
Solar gains	181.9330	310.7877	426.7420	529.8924	593.5562	589.0095	567.9937	520.7143	462.5933	343.9756	218.0963	155.5675	(83)
Total gains	581.8870	708.7584	812.0126	894.6812	937.5962	912.9845	878.8809	837.3280	789.6784	691.7470	589.6485	544.9100	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.5976	59.7624	59.9247	60.6994	60.8466	61.5412	61.5412	61.6715	61.2717	60.8466	60.5496	60.2422	
alpha	4.9732	4.9842	4.9950	5.0466	5.0564	5.1027	5.1027	5.1114	5.0848	5.0564	5.0366	5.0161	
util living area	0.9932	0.9819	0.9542	0.8834	0.7501	0.5657	0.4126	0.4503	0.6820	0.9152	0.9841	0.9950	(86)
MIT	19.9137	20.1338	20.4126	20.7092	20.9014	20.9814	20.9969	20.9952	20.9533	20.6935	20.2436	19.8744	(87)
Th 2	19.9479	19.9505	19.9531	19.9650	19.9672	19.9777	19.9777	19.9796	19.9737	19.9672	19.9627	19.9580	(88)
util rest of house	0.9910	0.9763	0.9403	0.8506	0.6898	0.4821	0.3182	0.3528	0.5979	0.8833	0.9783	0.9934	(89)
MIT 2	18.5227	18.8419	19.2383	19.6473	19.8794	19.9665	19.9766	19.9778	19.9412	19.6394	19.0122	18.4728	(90)
Living area fraction									fLA = Living area / (4) =			0.3678	(91)
MIT	19.0343	19.3171	19.6702	20.0378	20.2553	20.3397	20.3519	20.3520	20.3135	20.0271	19.4651	18.9883	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0343	19.3171	19.6702	20.0378	20.2553	20.3397	20.3519	20.3520	20.3135	20.0271	19.4651	18.9883	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9884	0.9719	0.9358	0.8532	0.7076	0.5124	0.3530	0.3888	0.6271	0.8854	0.9746	0.9913	(94)
Useful gains	575.1541	688.8759	759.9132	763.3559	663.4653	467.7964	310.2535	325.5330	495.1756	612.5055	574.6539	540.1574	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1262.2479	1231.6626	1122.0926	936.8273	717.8599	476.1781	311.2620	327.1732	517.7464	791.0119	1042.6279	1253.3142	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	511.1978	364.7526	269.4614	124.8994	40.4696	0.0000	0.0000	0.0000	0.0000	132.8088	336.9413	530.5887	(98)
Space heating												2311.1196	(98)
Space heating per m2												(98) / (4) =	31.4353 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												2471.7857 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	511.1978	364.7526	269.4614	124.8994	40.4696	0.0000	0.0000	0.0000	0.0000	132.8088	336.9413	530.5887 (98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000 (210)
Space heating fuel (main heating system)	546.7357	390.1098	288.1941	133.5823	43.2829	0.0000	0.0000	0.0000	0.0000	142.0415	360.3650	567.4745 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
Efficiency of water heater (217)m	87.2968	86.8032	85.9119	84.1629	81.7834	79.8000	79.8000	79.8000	79.8000	84.2280	86.5295	79.8000 (216)
Fuel for water heating, kWh/month	220.6209	195.5900	207.6106	190.0718	191.7541	175.7022	168.8423	185.1357	184.7660	196.9364	202.5853	215.0083 (219)
Water heating fuel used												2334.6235 (219)
Annual totals kWh/year												
Space heating fuel - main system												2471.7857 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												323.3067 (232)
Total delivered energy for all uses												5204.7160 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2471.7857	0.2160	533.9057 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2334.6235	0.2160	504.2787 (264)
Space and water heating			1038.1844 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	323.3067	0.5190	167.7962 (268)
Total CO2, kg/m2/year			1244.9056 (272)
Emissions per m2 for space and water heating			14.1211 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2823 (272b)
Emissions per m2 for pumps and fans			0.5294 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.1211 * 1.00) + 2.2823 + 0.5294, rounded to 2 d.p.			16.9300 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	094	Issued on Date	29/04/2022
Assessment Reference	094	Prop Type Ref	
Property			
SAP Rating	84 B	DER	16.54
Environmental	89 B	TER	17.77
CO ₂ Emissions (t/year)	0.73	% DER<TER	6.93
General Requirements Compliance	Fail	DFEE	35.13
		TFEE	38.58
		% DFEE<TFEE	8.96
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 17.77 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.54 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)38.6 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)35.1 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing South East:	6.24 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Windows facing South West:	1.97 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			10.4200	1.1450	11.9313		(27)
External Wall	39.4300	10.4200	29.0100	0.1500	4.3515		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Total net area of external elements Aum(A, m ²)			56.9300				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	22.0753	(33)
Party Wall 1			17.0500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.2660 (36)
Total fabric heat loss						(33) + (36) =	29.3413 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	11.7351	11.6015	11.4680	10.8002	10.6666	9.9988	9.9988	9.8652	10.2659	10.6666	10.9337	11.2009 (38)
Heat transfer coeff	41.0764	40.9428	40.8093	40.1415	40.0079	39.3401	39.3401	39.2065	39.6072	40.0079	40.2750	40.5422 (39)
Average = Sum(39)m / 12 =												40.1081 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8087	0.8061	0.8035	0.7903	0.7877	0.7746	0.7746	0.7719	0.7798	0.7877	0.7930	0.7982 (40)
HLP (average)												0.7897 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												

Design SAP
elmhurst energy

Store volume														110.0000	(47)
b) If manufacturer declared loss factor is not known :															
Hot water storage loss factor from Table 2 (kWh/litre/day)														0.0152	(51)
Volume factor from Table 2a														1.0294	(52)
Temperature factor from Table 2b														0.6000	(53)
Enter (49) or (54) in (55)														1.0327	(55)
Total storage loss															
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	30.9817	32.0144	(56)	
If cylinder contains dedicated solar storage															
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	30.9817	32.0144	(57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	(59)	
Total heat required for water heating calculated for each month															
177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	162.4461	173.5921	(62)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)	
							Solar input (sum of months) = Sum(63)m =							0.0000	(63)
Output from w/h															
177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	162.4461	173.5921	(64)	
							Total per year (kWh/year) = Sum(64)m =							1829.1942	(64)
Heat gains from water heating, kWh/month															
84.8430	75.4698	80.8830	74.7574	74.8902	69.2597	68.7450	72.3625	71.2721	77.4089	79.0216	83.5613	79.0216	83.5613	(65)	

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.3089	11.8209	9.6134	7.2779	5.4403	4.5930	4.9629	6.4509	8.6584	10.9938	12.8314	13.6788 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	114.0363	112.3063	108.7138	103.8297	100.6589	96.1941	92.3992	97.2615	98.9891	104.0442	109.7522	112.3135 (72)
Total internal gains	325.3314	323.6625	313.9587	298.4287	282.9297	267.7578	257.7459	262.5472	270.3860	286.0871	304.1233	317.3917 (73)

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
Southeast					6.2400	36.7938	0.4000	0.8000	0.7700	50.9147 (77)		
South					2.2100	46.7521	0.4000	0.8000	0.7700	22.9127 (78)		
Southwest					1.9700	36.7938	0.4000	0.8000	0.7700	16.0740 (79)		
Solar gains	89.9014	151.6316	203.9258	247.4718	272.9739	269.2882	260.3244	241.4662	218.9840	166.5863	107.3964	77.1270 (83)
Total gains	415.2328	475.2941	517.8846	545.9005	555.9036	537.0461	518.0703	504.0134	489.3700	452.6734	411.5197	394.5187 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)											21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	85.8664	86.1465	86.4285	87.8663	88.1596	89.6562	89.6562	89.9616	89.0515	88.1596	87.5749	86.9979
alpha	6.7244	6.7431	6.7619	6.8578	6.8773	6.9771	6.9771	6.9974	6.9368	6.8773	6.8383	6.7999
util living area	0.9862	0.9666	0.9214	0.8164	0.6547	0.4676	0.3340	0.3577	0.5541	0.8334	0.9645	0.9896 (86)
MIT	20.4549	20.6059	20.7739	20.9208	20.9839	20.9987	20.9999	20.9998	20.9958	20.9231	20.6778	20.4257 (87)
Th 2	20.2458	20.2480	20.2503	20.2617	20.2640	20.2754	20.2754	20.2777	20.2709	20.2640	20.2594	20.2549 (88)
util rest of house	0.9824	0.9581	0.9033	0.7825	0.6077	0.4152	0.2791	0.3016	0.4974	0.7949	0.9541	0.9866 (89)
MIT 2	19.5323	19.7482	19.9805	20.1779	20.2500	20.2746	20.2754	20.2777	20.2680	20.1863	19.8615	19.4977 (90)
Living area fraction									fLA = Living area / (4) =			0.5025 (91)
MIT	19.9959	20.1792	20.3792	20.5512	20.6188	20.6384	20.6384	20.6405	20.6336	20.5565	20.2717	19.9640 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9959	20.1792	20.3792	20.5512	20.6188	20.6384	20.6394	20.6405	20.6336	20.5565	20.2717	19.9640 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9809	0.9572	0.9067	0.7963	0.6306	0.4415	0.3067	0.3298	0.5258	0.8109	0.9543	0.9853 (94)
Useful gains	407.2985	454.9645	469.5542	434.7004	350.5744	237.1038	158.8824	166.2085	257.3025	367.0777	392.6927	388.7040 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	644.7296	625.5726	566.3988	467.6963	356.8217	237.5516	158.9114	166.2560	258.7798	398.3391	530.4891	639.1061 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	176.6487	114.6486	72.0524	23.7571	4.6479	0.0000	0.0000	0.0000	0.0000	23.2585	99.2134	186.2991 (98)
Space heating												700.5259 (98)
Space heating per m2												13.7926 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	700.5259 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	735.5522 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1920.6539 (310a)
Electricity used for heat distribution	26.5621 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	235.0396 (332)
Total delivered energy for all uses	3013.2369 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	2967.8280	0.2160	641.0508 (367)
Electrical energy for heat distribution	26.5621	0.5190	13.7857 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			654.8365 (373)
Space and water heating			654.8365 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	235.0396	0.5190	121.9856 (379)
Total CO2, kg/year			840.1356 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			16.5400 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			16.5400 ZC1
Total Floor Area		TFA	50.7900
Assumed number of occupants		N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			17.4175 ZC2
CO2 emissions from cooking, equation (L16)			3.1526 ZC3
Total CO2 emissions			37.1101 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			37.1101 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.1575 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4075 (18)
Number of sides sheltered					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3464 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4416	0.4330	0.4243	0.3810	0.3724	0.3291	0.3291	0.3204	0.3464	0.3724	0.3897	0.4070 (22b)
Effective ac	0.5975	0.5937	0.5900	0.5726	0.5693	0.5541	0.5541	0.5513	0.5600	0.5693	0.5759	0.5828 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900			(26)				
TER Opening Type (Uw = 1.40)			10.4200	1.3258	13.8144			(27)				
External Wall	39.4300	10.4200	29.0100	0.1800	5.2218			(29a)				
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098			(29a)				
Total net area of external elements Aum(A, m2)			56.9300					(31)				
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	23.7360		(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								5.6018 (36)				
Total fabric heat loss								(33) + (36) = 29.3378 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 25.0373	Feb 24.8786	Mar 24.7230	Apr 23.9925	May 23.8558	Jun 23.2195	Jul 23.2195	Aug 23.1017	Sep 23.4646	Oct 23.8558	Nov 24.1323	Dec 24.4214 (38)
Heat transfer coeff	54.3751	54.2164	54.0608	53.3303	53.1936	52.5573	52.5573	52.4395	52.8024	53.1936	53.4701	53.7592 (39)
Average = Sum(39)m / 12 =												53.3296 (39)
HLP	Jan 1.0706	Feb 1.0675	Mar 1.0644	Apr 1.0500	May 1.0473	Jun 1.0348	Jul 1.0348	Aug 1.0325	Sep 1.0396	Oct 1.0473	Nov 1.0528	Dec 1.0585 (40)
HLP (average)												1.0500 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.3700	11.8751	9.6575	7.3113	5.4653	4.6140	4.9856	6.4805	8.6981	11.0443	12.8903	13.7416	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.0571	317.3814	307.6675	292.1267	276.6192	261.4435	251.4333	256.2414	264.0903	279.8021	297.8468	311.1191	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
Southeast					6.2400	36.7938	0.6300	0.7000			0.7700			70.1668 (77)
South					2.2100	46.7521	0.6300	0.7000			0.7700			31.5766 (78)
Southwest					1.9700	36.7938	0.6300	0.7000			0.7700			22.1520 (79)
Solar gains	123.8953	208.9673	281.0353	341.0471	376.1922	371.1129	358.7596	332.7706	301.7873	229.5768	148.0056	106.2907	(83)	
Total gains	442.9525	526.3487	588.7027	633.1738	652.8114	632.5564	610.1929	589.0120	565.8776	509.3789	445.8524	417.4098	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	64.8658	65.0557	65.2428	66.1366	66.3065	67.1093	67.1093	67.2601	66.7978	66.3065	65.9636	65.6089	
alpha	5.3244	5.3370	5.3495	5.4091	5.4204	5.4740	5.4740	5.4840	5.4532	5.4204	5.3976	5.3739	
util living area	0.9887	0.9722	0.9357	0.8519	0.7087	0.5238	0.3778	0.4077	0.6218	0.8769	0.9736	0.9914	(86)
MIT	20.1179	20.3220	20.5623	20.8005	20.9396	20.9905	20.9987	20.9980	20.9764	20.7992	20.4181	20.0799	(87)
Th 2	20.0249	20.0275	20.0300	20.0419	20.0441	20.0544	20.0544	20.0564	20.0504	20.0441	20.0396	20.0349	(88)
util rest of house	0.9852	0.9643	0.9183	0.8160	0.6506	0.4499	0.2973	0.3251	0.5450	0.8383	0.9647	0.9888	(89)
MIT 2	18.8745	19.1679	19.5050	19.8279	19.9912	20.0487	20.0540	20.0556	20.0345	19.8362	19.3179	18.8271	(90)
Living area fraction	19.4993	19.7478	20.0363	20.3166	20.4677	20.5219	20.5286	20.5291	20.5078	20.3201	19.8707	19.4566	(91)
MIT	19.4993	19.7478	20.0363	20.3166	20.4677	20.5219	20.5286	20.5291	20.5078	20.3201	19.8707	19.4566	(92)
Temperature adjustment	19.4993	19.7478	20.0363	20.3166	20.4677	20.5219	20.5286	20.5291	20.5078	20.3201	19.8707	19.4566	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	435.3805	506.1091	540.6980	523.6213	442.0584	307.9481	206.1159	215.9611	329.8019	433.2182	429.2676	411.8993	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	826.4619	804.9926	731.7828	608.8514	466.3876	311.2393	206.4788	216.5283	338.3458	517.0454	682.8493	820.1804	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	290.9645	200.8497	142.1671	61.3657	18.1010	0.0000	0.0000	0.0000	0.0000	62.3674	182.5788	303.7612	(98)
Space heating												1262.1553	(98)
Space heating per m2												24.8505	(99)

8c. Space cooling requirement

Not applicable

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1349.8987 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	290.9645	200.8497	142.1671	61.3657	18.1010	0.0000	0.0000	0.0000	0.0000	62.3674	182.5788	303.7612	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	311.1920	214.8125	152.0504	65.6317	19.3593	0.0000	0.0000	0.0000	0.0000	66.7031	195.2714	324.8782	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	86.2544	85.6122	84.5529	82.7641	80.9033	79.8000	79.8000	79.8000	79.8000	82.7217	85.2680	79.8000	(216)
Fuel for water heating, kWh/month	195.6597	173.9665	185.5115	170.6290	171.6021	156.2471	150.8144	164.4484	163.8315	176.9871	180.6589	190.8184	(219)
Water heating fuel used												2081.1746	(219)
Annual totals kWh/year													
Space heating fuel - main system												1349.8987	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												236.1179	(232)
Total delivered energy for all uses												3742.1912	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1349.8987	0.2160	291.5781 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2081.1746	0.2160	449.5337 (264)
Space and water heating			741.1118 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	236.1179	0.5190	122.5452 (268)
Total CO2, kg/m2/year			902.5820 (272)
Emissions per m2 for space and water heating			14.5917 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4128 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.5917 * 1.00) + 2.4128 + 0.7664, rounded to 2 d.p.			17.7700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	103			Issued on Date	29/04/2022
Assessment Reference	103	Prop Type Ref			
Property					
SAP Rating	83 B	DER	17.65	TER	19.13
Environmental	87 B	% DER<TER	7.76		
CO ₂ Emissions (t/year)	1.05	DFEE	47.31	TFEE	55.18
General Requirements Compliance	Pass	% DFEE<TFEE	14.26		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 19.13 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.65 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)55.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)47.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading: Average
Windows facing North: 5.88 m², No overhang
Windows facing North West: 7.10 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
							Air changes per hour					
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test								Yes				
Measured/design AP50								3.0000				
Infiltration rate								0.1500 (18)				
Number of sides sheltered								2 (19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1275 (21)				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			12.9800	1.1450	14.8626		(27)					
External Wall	35.0800	12.9800	22.1000	0.1500	3.3150		(29a)					
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)					
Core	18.2300		18.2300	0.2500	4.5575		(29a)					
Main Roof	72.7700		72.7700	0.1000	7.2770		(30)					
Total net area of external elements Aum(A, m2)			143.5800				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	35.8046		(33)					
Party Wall 1			18.3000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.2144 (36)					
Total fabric heat loss						(33) + (36) =	46.0190 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 17.0688	Feb 16.8774	Mar 16.6860	Apr 15.7292	May 15.5379	Jun 14.5811	Jul 14.5811	Aug 14.3897	Sep 14.9638	Oct 15.5379	Nov 15.9206	Dec 16.3033 (38)
Heat transfer coeff	63.0878	62.8964	62.7050	61.7482	61.5569	60.6001	60.6001	60.4087	60.9828	61.5569	61.9396	62.3223 (39)
Average = Sum(39)m / 12 =												61.7004 (39)
HLP	Jan 0.8669	Feb 0.8643	Mar 0.8617	Apr 0.8485	May 0.8459	Jun 0.8328	Jul 0.8328	Aug 0.8301	Sep 0.8380	Oct 0.8459	Nov 0.8512	Dec 0.8564 (40)
HLP (average)												0.8479 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	Jan 98.0067	Feb 94.4428	Mar 90.8789	Apr 87.3151	May 83.7512	Jun 80.1873	Jul 80.1873	Aug 83.7512	Sep 87.3151	Oct 90.8789	Nov 94.4428	Dec 98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)												Total = Sum(45)m = 1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)
Water storage loss:												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h												
200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(64)
Heat gains from water heating, kWh/month												
92.5474	82.2081	87.8363	80.8195	80.7069	74.2791	73.3961	77.6998	76.6732	83.7032	85.8924	91.0225	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
18.2514	16.2107	13.1835	9.9807	7.4607	6.2986	6.8059	8.8466	11.8739	15.0766	17.5966	18.7587	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	(71)
Water heating gains (Table 5)												
124.3916	122.3335	118.0596	112.2492	108.4770	103.1654	98.6507	104.4353	106.4905	112.5044	119.2950	122.3421	(72)
Total internal gains												
403.9886	402.0033	389.3762	369.0248	348.4200	328.4945	315.5005	321.2122	331.6207	352.1755	375.7988	393.4597	(73)

6. Solar gains

[Jan]				Area	Solar flux	g		FF	Access		Gains	
				m2	Table 6a	Specific data		Specific data	factor		W	
					W/m2	or Table 6b		or Table 6c	Table 6d			
North				5.8800	10.6334	0.4000		0.8000	0.7700		13.8654 (74)	
Northwest				7.1000	11.2829	0.4000		0.8000	0.7700		17.7649 (81)	

Solar gains	31.6303	62.6585	110.1764	179.3190	241.2494	257.6284	240.8129	191.6050	133.5227	75.7335	39.4577	26.0666 (83)
Total gains	435.6190	464.6619	499.5526	548.3439	589.6693	586.1229	556.3134	512.8172	465.1433	427.9090	415.2565	419.5263 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1023	80.3460	80.5912	81.8400	82.0944	83.3906	83.3906	83.6547	82.8672	82.0944	81.5871	81.0861
alpha	6.3402	6.3564	6.3727	6.4560	6.4730	6.5594	6.5594	6.5770	6.5245	6.4730	6.4391	6.4057
util living area	0.9978	0.9962	0.9900	0.9599	0.8530	0.6461	0.4773	0.5374	0.8199	0.9743	0.9952	0.9983 (86)
MIT	20.1578	20.2515	20.4352	20.6985	20.9051	20.9875	20.9985	20.9969	20.9461	20.6949	20.3890	20.1434 (87)
Th 2	20.1957	20.1979	20.2002	20.2115	20.2137	20.2250	20.2250	20.2273	20.2205	20.2137	20.2092	20.2047 (88)
util rest of house	0.9971	0.9949	0.9865	0.9461	0.8101	0.5745	0.3943	0.4495	0.7558	0.9627	0.9934	0.9977 (89)
MIT 2	19.0628	19.2012	19.4695	19.8521	20.1209	20.2167	20.2244	20.2259	20.1771	19.8539	19.4107	19.0487 (90)
Living area fraction									fLA = Living area / (4) =			0.3848 (91)
MIT	19.4841	19.6053	19.8411	20.1777	20.4226	20.5133	20.5223	20.5226	20.4730	20.1775	19.7871	19.4699 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4841	19.6053	19.8411	20.1777	20.4226	20.5133	20.5223	20.5226	20.4730	20.1775	19.7871	19.4699 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9963	0.9937	0.9846	0.9454	0.8224	0.6017	0.4263	0.4835	0.7781	0.9621	0.9922	0.9970 (94)
Useful gains	434.0073	461.7346	491.8507	518.3851	484.9281	352.6851	237.1735	247.9270	361.9424	411.6894	412.0062	418.2885 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
957.9321	924.9119	836.5524	696.3803	536.9374	358.3453	237.6890	249.0393	388.6408	589.5607	785.8344	951.6560	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
389.8000	311.2551	256.4580	128.1565	38.6950	0.0000	0.0000	0.0000	0.0000	132.3363	269.1563	396.8254	(98)
Space heating												1922.6826 (98)
Space heating per m2												(98) / (4) =
												26.4214 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	1922.6826	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	2018.8168	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating:		
Annual water heating requirement	2052.6825	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2155.3166	(310a)
Electricity used for heat distribution	41.7413	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)		
mechanical ventilation fans (SFP = 0.7625)	169.2357	(330a)
Total electricity for the above, kWh/year	169.2357	(331)
Electricity for lighting (calculated in Appendix L)	322.3254	(332)
Total delivered energy for all uses	4665.6945	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	4663.8361	0.2160	1007.3886 (367)
Electrical energy for heat distribution	41.7413	0.5190	21.6638 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1029.0524 (373)
Space and water heating			1029.0524 (376)
Pumps and fans	169.2357	0.5190	87.8333 (378)
Energy for lighting	322.3254	0.5190	167.2869 (379)
Total CO2, kg/year			1284.1726 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			17.6500 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		17.6500	ZC1
Total Floor Area	TFA	72.7700	
Assumed number of occupants	N	2.3115	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.5855	ZC2
CO2 emissions from cooking, equation (L16)		2.3976	ZC3
Total CO2 emissions		36.6331	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		36.6331	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1649 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4149 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3527 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4497	0.4408	0.4320	0.3879	0.3791	0.3350	0.3350	0.3262	0.3527	0.3791	0.3968	0.4144 (22b)
Effective ac	0.6011	0.5972	0.5933	0.5752	0.5719	0.5561	0.5561	0.5532	0.5622	0.5719	0.5787	0.5859 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			12.9800	1.3258	17.2083		(27)
External Wall	35.0800	12.9800	22.1000	0.1800	3.9780		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Core	18.2300		18.2300	0.1800	3.2814		(29a)
Main Roof	72.7700		72.7700	0.1300	9.4601		(30)
Total net area of external elements Aum(A, m ²)			143.5800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 38.6276		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.0934 (36)
Total fabric heat loss						(33) + (36) =	46.7210 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	36.0868	35.8511	35.6201	34.5351	34.3321	33.3870	33.3870	33.2120	33.7511	34.3321	34.7427	35.1721 (38)
Heat transfer coeff	82.8078	82.5721	82.3411	81.2561	81.0531	80.1081	80.1081	79.9331	80.4721	81.0531	81.4638	81.8931 (39)
Average = Sum(39)m / 12 =												81.2551 (39)
HLP	1.1379	1.1347	1.1315	1.1166	1.1138	1.1008	1.1008	1.0984	1.1058	1.1138	1.1195	1.1254 (40)
HLP (average)												1.1166 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)										Total = Sum(45)m =		1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												
21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133	(46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)													0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500	(64)
Heat gains from water heating, kWh/month	85.6018	75.9347	80.8908	74.0980	73.7613	67.5576	66.4506	70.7543	69.9517	76.7577	79.1709	84.0770	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5727	16.4961	13.4155	10.1564	7.5920	6.4095	6.9257	9.0023	12.0829	15.3420	17.9064	19.0889	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	(71)
Water heating gains (Table 5)	115.0562	112.9981	108.7242	102.9139	99.1416	93.8300	89.3153	95.0999	97.1551	103.1690	109.9597	113.0067	(72)
Total internal gains	397.9745	395.9533	383.2729	362.8651	342.2159	322.2700	309.2849	315.0325	325.4943	346.1056	369.7732	387.4546	(73)

6. Solar gains

[Jan]					Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
North					5.8800	10.6334	0.6300	0.7000			0.7700	19.1083
Northwest					7.1000	11.2829	0.6300	0.7000			0.7700	24.4823
Solar gains	43.5906	86.3513	151.8369	247.1241	332.4718	355.0441	331.8703	264.0557	184.0109	104.3702	54.3776	35.9231
Total gains	441.5651	482.3046	535.1098	609.9892	674.6877	677.3141	641.1552	579.0882	509.5053	450.4758	424.1508	423.3777

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.0265	61.2007	61.3724	62.1919	62.3477	63.0832	63.0832	63.2213	62.7978	62.3477	62.0334	61.7081	
alpha	5.0684	5.0800	5.0915	5.1461	5.1565	5.2055	5.2055	5.2148	5.1865	5.1565	5.1356	5.1139	
util living area	0.9979	0.9963	0.9907	0.9656	0.8802	0.7044	0.5385	0.6119	0.8721	0.9812	0.9960	0.9983	(86)
MIT	19.7813	19.9014	20.1404	20.4882	20.7922	20.9537	20.9906	20.9826	20.8557	20.4791	20.0787	19.7644	(87)
Th 2	19.9700	19.9726	19.9752	19.9873	19.9896	20.0001	20.0001	20.0021	19.9961	19.9896	19.9850	19.9802	(88)
util rest of house	0.9972	0.9950	0.9872	0.9522	0.8358	0.6148	0.4220	0.4906	0.8071	0.9716	0.9943	0.9978	(89)
MIT 2	18.3459	18.5231	18.8727	19.3786	19.7841	19.9693	19.9967	19.9948	19.8755	19.3742	18.7914	18.3285	(90)
Living area fraction	18.8982	19.0534	19.3604	19.8055	20.1720	20.3481	20.3791	20.3749	20.2527	19.7994	19.2867	18.8810	(92)
Temperature adjustment	18.8982	19.0534	19.3604	19.8055	20.1720	20.3481	20.3791	20.3749	20.2527	19.7994	19.2867	18.8810	(93)
adjusted MIT	18.8982	19.0534	19.3604	19.8055	20.1720	20.3481	20.3791	20.3749	20.2527	19.7994	19.2867	18.8810	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	439.8601	479.1310	526.7857	579.0521	570.0164	438.7070	299.4915	311.3024	420.9107	436.5878	421.0524	422.0565	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1208.8469	1168.6799	1058.9438	886.1419	686.6832	460.4690	302.7366	317.7238	495.1188	745.6361	992.7749	1202.2716	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	572.1262	463.3769	395.9256	221.1046	86.8001	0.0000	0.0000	0.0000	0.0000	229.9319	411.6402	580.4800	(98)
Space heating												2961.3856	(98)
Space heating per m ²												40.6951	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3167.2573 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	572.1262	463.3769	395.9256	221.1046	86.8001	0.0000	0.0000	0.0000	0.0000	229.9319	411.6402	580.4800	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	611.8996	495.5902	423.4499	236.4755	92.8343	0.0000	0.0000	0.0000	0.0000	245.9165	440.2569	620.8343	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500	(64)
Efficiency of water heater (217)m	87.5510	87.3666	86.8899	85.6861	83.3169	79.8000	79.8000	79.8000	79.8000	85.6937	87.0232	87.6329	(216)
Fuel for water heating, kWh/month	219.2276	193.6690	204.5894	186.0878	187.6277	175.1642	168.3438	184.5636	184.1870	192.9396	200.7605	213.7895	(219)
Water heating fuel used												2310.9496	(219)
Annual totals kWh/year													
Space heating fuel - main system												3167.2573	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												327.9999	(232)
Total delivered energy for all uses												5881.2067	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3167.2573	0.2160	684.1276 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2310.9496	0.2160	499.1651 (264)
Space and water heating			1183.2927 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	327.9999	0.5190	170.2319 (268)
Total CO2, kg/m2/year			1392.4496 (272)
Emissions per m2 for space and water heating			16.2607 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3393 (272b)
Emissions per m2 for pumps and fans			0.5349 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.2607 * 1.00) + 2.3393 + 0.5349, rounded to 2 d.p.			19.1300 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	104			Issued on Date	29/04/2022
Assessment Reference	104	Prop Type Ref			
Property					
SAP Rating	84 B	DER	16.79	TER	18.04
Environmental	88 B	% DER<TER	6.93		
CO ₂ Emissions (t/year)	1.02	DFEE	44.00	TFEE	50.74
General Requirements Compliance	Fail	% DFEE<TFEE	13.28		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 74 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.04 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.79 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 50.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 44.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading: Average
Windows facing North: 1.97 m², No overhang
Windows facing North East: 9.35 m², No overhang
Windows facing East: 2.21 m², No overhang
Windows facing South East: 6.24 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					0.0000 / (5) = 0.0000 (8)
Measured/design AP50					Yes
Infiltration rate					3.0000
Number of sides sheltered					0.1500 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			19.7700	1.1450	22.6374		(27)
External Wall	49.6500	19.7700	29.8800	0.1500	4.4820		(29a)
Corridor	5.4000	1.8900	3.5100	0.2500	0.8775		(29a)
Main Roof	73.5200		73.5200	0.1000	7.3520		(30)
Total net area of external elements Aum(A, m ²)			128.5700				(31)
Fabric heat loss, W/K = Sum (A x U)							(32)
Party Wall 1			38.0500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.0914 (36)
Total fabric heat loss						(33) + (36) =	49.3303 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	17.2447	17.0514	16.8580	15.8913	15.6980	14.7313	14.7313	14.5380	15.1180	15.6980	16.0847	16.4714 (38)
Average = Sum(39)m / 12 =	66.5750	66.3817	66.1883	65.2217	65.0283	64.0616	64.0616	63.8683	64.4483	65.0283	65.4150	65.8017 (39)
												65.1733 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9055	0.9029	0.9003	0.8871	0.8845	0.8713	0.8713	0.8687	0.8766	0.8845	0.8898	0.8950 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy content (annual)	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1408.1991 (45)
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	201.2769	177.6201	187.0442	168.3717	165.5050	148.6122	143.4181	156.4202	155.8451	174.5575	183.6979	196.6701	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
	Solar input (sum of months) = Sum (63)m =											0.0000 (63)	
Output from w/h													
	201.2769	177.6201	187.0442	168.3717	165.5050	148.6122	143.4181	156.4202	155.8451	174.5575	183.6979	196.6701	(64)
	Total per year (kWh/year) = Sum (64)m =											2059.0388 (64)	
Heat gains from water heating, kWh/month													
	92.7665	82.3997	88.0341	80.9919	80.8723	74.4219	73.5284	77.8516	76.8268	83.8823	86.0878	91.2347	(65)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1717.6202 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1803.5012 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2059.0388 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2161.9908 (310a)
Electricity used for heat distribution	39.6549 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	170.9800 (330a)
Total electricity for the above, kWh/year	170.9800 (331)
Electricity for lighting (calculated in Appendix L)	323.3395 (332)
Total delivered energy for all uses	4459.8114 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	4430.7173	0.2160	957.0349 (367)
Electrical energy for heat distribution	39.6549	0.5190	20.5809 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			977.6158 (373)
Space and water heating			977.6158 (376)
Pumps and fans	170.9800	0.5190	88.7386 (378)
Energy for lighting	323.3395	0.5190	167.8132 (379)
Total CO2, kg/year			1234.1676 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			16.7900 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		16.7900 ZC1
Total Floor Area	TFA	73.5200
Assumed number of occupants	N	2.3285
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.5530 ZC2
CO2 emissions from cooking, equation (L16)		2.3787 ZC3
Total CO2 emissions		35.7217 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		35.7217 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1632 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4132 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3512 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4478	0.4390	0.4303	0.3864	0.3776	0.3337	0.3337	0.3249	0.3512	0.3776	0.3951	0.4127 (22b)
	0.6003	0.5964	0.5926	0.5746	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			16.4900	1.3258	21.8617		(27)
External Wall	49.6500	16.4900	33.1600	0.1800	5.9688		(29a)
Corridor	5.4000	1.8900	3.5100	0.1800	0.6318		(29a)
Main Roof	73.5200		73.5200	0.1300	9.5576		(30)
Total net area of external elements Aum(A, m ²)			128.5700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.9099		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.8504 (36)
Total fabric heat loss						(33) + (36) =	48.7603 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.4091	36.1729	35.9414	34.8541	34.6506	33.7036	33.7036	33.5282	34.0684	34.6506	35.0622	35.4924 (38)
Heat transfer coeff	85.1694	84.9332	84.7018	83.6144	83.4110	82.4639	82.4639	82.2886	82.8287	83.4110	83.8225	84.2528 (39)
Average = Sum(39)m / 12 =												83.6134 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1585	1.1552	1.1521	1.1373	1.1345	1.1217	1.1217	1.1193	1.1266	1.1345	1.1401	1.1460 (40)
HLP (average)												1.1373 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy content (annual)	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1408.1991 (45)
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
Heat gains from water heating, kWh/month	85.8210	76.1264	81.0886	74.2704	73.9268	67.7004	66.5829	70.9061	70.1053	76.9367	79.3664	84.2892 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3070	16.2601	13.2236	10.0111	7.4834	6.3178	6.8266	8.8735	11.9100	15.1225	17.6502	18.8158	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	(71)
Water heating gains (Table 5)	115.3508	113.2833	108.9900	103.1533	99.3640	94.0283	89.4931	95.3039	97.3685	103.4096	110.2311	113.2919	(72)
Total internal gains	399.9539	397.9707	385.2706	364.7888	344.0400	323.9750	310.8872	316.6137	327.0851	347.7714	371.5522	389.3425	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W			
North				1.6400	10.6334	0.6300	0.7000	0.7700	5.3295 (74)			
Northeast				7.8000	11.2829	0.6300	0.7000	0.7700	26.8961 (75)			
East				1.8400	19.6403	0.6300	0.7000	0.7700	11.0443 (76)			
Southeast				5.2100	36.7938	0.6300	0.7000	0.7700	58.5847 (77)			
Solar gains	101.8546	186.3291	288.0641	410.8612	508.2861	525.4572	497.9438	422.2753	330.2245	214.9569	124.3588	85.6262 (83)
Total gains	501.8085	584.2998	673.3347	775.6500	852.3261	849.4322	808.8310	738.8890	657.3096	562.7283	495.9110	474.9687 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.9459	60.1126	60.2769	61.0607	61.2096	61.9126	61.9126	62.0445	61.6399	61.2096	60.9091	60.5981	
alpha	4.9964	5.0075	5.0185	5.0707	5.0806	5.1275	5.1275	5.1363	5.1093	5.0806	5.0606	5.0399	
util living area	0.9964	0.9918	0.9773	0.9243	0.7938	0.5996	0.4445	0.5041	0.7728	0.9580	0.9923	0.9973	(86)
MIT	19.8236	19.9945	20.2720	20.6225	20.8730	20.9764	20.9958	20.9922	20.9185	20.5793	20.1387	19.7961	(87)
Th 2	19.9534	19.9560	19.9585	19.9705	19.9727	19.9832	19.9832	19.9851	19.9792	19.9727	19.9682	19.9635	(88)
util rest of house	0.9953	0.9891	0.9696	0.8995	0.7367	0.5135	0.3440	0.3971	0.6915	0.9390	0.9893	0.9964	(89)
MIT 2	18.3958	18.6461	19.0475	19.5431	19.8562	19.9686	19.9817	19.9821	19.9182	19.4973	18.8660	18.3629	(90)
Living area fraction									fLA = Living area / (4) =			0.3678	(91)
MIT	18.9210	19.1420	19.4978	19.9401	20.2302	20.3393	20.3547	20.3536	20.2861	19.8953	19.3341	18.8900	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9210	19.1420	19.4978	19.9401	20.2302	20.3393	20.3547	20.3536	20.2861	19.8953	19.3341	18.8900	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	498.6007	576.2983	649.9444	697.0690	641.0413	462.5377	308.2314	322.6268	471.9040	527.4135	489.3498	472.6166	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1245.2596	1209.6195	1100.9398	923.1084	711.5096	473.2813	309.6252	325.3392	512.3857	775.3286	1025.4940	1237.6725	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	555.5143	425.5918	335.5405	162.7484	52.4284	0.0000	0.0000	0.0000	0.0000	184.4488	386.0238	569.2016	(98)
Space heating												2671.4977	(98)
Space heating per m2										(98) / (4) =		36.3370	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2857.2168 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	555.5143	425.5918	335.5405	162.7484	52.4284	0.0000	0.0000	0.0000	0.0000	184.4488	386.0238	569.2016	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	594.1329	455.1784	358.8669	174.0625	56.0732	0.0000	0.0000	0.0000	0.0000	197.2715	412.8596	608.7718	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882	(64)
Efficiency of water heater (217)m	87.4803	87.1671	86.4756	84.8598	82.2361	79.8000	79.8000	79.8000	79.8000	85.0973	86.8627	79.8000	(216)
Fuel for water heating, kWh/month	220.1583	194.7735	206.2572	188.5108	190.6986	175.7022	168.8423	185.1357	184.7660	194.9246	201.8081	214.6367	(219)
Water heating fuel used												2326.2141	(219)
Annual totals kWh/year													
Space heating fuel - main system												2857.2168	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												323.3067	(232)
Total delivered energy for all uses												5581.7376	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2857.2168	0.2160	617.1588 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2326.2141	0.2160	502.4622 (264)
Space and water heating			1119.6211 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	323.3067	0.5190	167.7962 (268)
Total CO2, kg/m2/year			1326.3423 (272)
Emissions per m2 for space and water heating			15.2288 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2823 (272b)
Emissions per m2 for pumps and fans			0.5294 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.2288 * 1.00) + 2.2823 + 0.5294, rounded to 2 d.p.			18.0400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	105	Issued on Date	29/04/2022
Assessment Reference	105	Prop Type Ref	
Property			
SAP Rating	83 B	DER	17.21
Environmental	89 B	TER	18.50
CO ₂ Emissions (t/year)	0.75	% DER<TER	6.98
General Requirements Compliance	Pass	DFEE	38.30
		TFEE	41.63
		% DFEE<TFEE	8.00
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.50 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.21 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)41.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)38.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK
Based on:
Overshading: Average
Windows facing South East: 6.24 m², No overhang
Windows facing South: 2.21 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)
External Wall	19.8500	8.4500	11.4000	0.1500	1.7100		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Main Roof	50.7900		50.7900	0.1000	5.0790		(30)
Total net area of external elements Aum(A, m ²)			88.1400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.2571		(33)
Party Wall 1			37.0000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.5542 (36)
Total fabric heat loss							(33) + (36) = 30.8113 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	11.1341	11.0123	10.8905	10.2816	10.1599	9.5510	9.5510	9.4292	9.7945	10.1599	10.4034	10.6470 (38)
Heat transfer coeff	41.9454	41.8236	41.7018	41.0929	40.9711	40.3623	40.3623	40.2405	40.6058	40.9711	41.2147	41.4582 (39)
Average = Sum(39)m / 12 =												41.0625 (39)
HLP	0.8259	0.8235	0.8211	0.8091	0.8067	0.7947	0.7947	0.7923	0.7995	0.8067	0.8115	0.8163 (40)
HLP (average)												0.8085 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)

[illegible]

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.4839	11.9763	9.7398	7.3736	5.5119	4.6534	5.0281	6.5357	8.7723	11.1384	13.0002	13.8587 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	114.0363	112.3063	108.7138	103.8297	100.6589	96.1941	92.3992	97.2615	98.9891	104.0442	109.7522	112.3135 (72)
Total internal gains	325.5065	323.8179	314.0852	298.5244	283.0012	267.8182	257.8112	262.6320	270.4999	286.2317	304.2921	317.5716 (73)

[Jan				Area	Solar flux		g		FF		Access		Gains
				m2	Table 6a		Specific data		Specific data		factor		W
					W/m2		or Table 6b		or Table 6c		Table 6d		
Southeast				6.2400	36.7938		0.4000		0.8000		0.7700		50.9147 (77)
South				2.2100	46.7521		0.4000		0.8000		0.7700		22.9127 (78)
Solar gains	73.8274	124.2516	166.4633	201.0539	220.9821	217.6723	210.5612	195.8614	178.4200	136.3256	88.1434		63.3710 (83)
Total gains	399.3338	448.0695	480.5485	499.5783	503.9832	485.4906	468.3724	458.4934	448.9198	422.5573	392.4355		380.9426 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil/m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	84.0876	84.3324	84.5787	85.8319	86.0870	87.3857	87.3857	87.6501	86.8616	86.0870	85.5783	85.0756
alpha	6.6058	6.6222	6.6386	6.7221	6.7391	6.8257	6.8257	6.8433	6.7908	6.7391	6.7052	6.6717
util living area	0.9894	0.9764	0.9460	0.8684	0.7244	0.5287	0.3789	0.4032	0.6143	0.8744	0.9736	0.9918 (86)
MIT	20.3998	20.5363	20.7048	20.8751	20.9685	20.9968	20.9997	20.9996	20.9913	20.8883	20.6240	20.3726 (87)
Th 2	20.2310	20.2330	20.2351	20.2455	20.2476	20.2579	20.2579	20.2600	20.2538	20.2476	20.2434	20.2393 (88)
util rest of house	0.9863	0.9700	0.9320	0.8385	0.6755	0.4689	0.3151	0.3386	0.5520	0.8400	0.9654	0.9895 (89)
MIT 2	19.4413	19.6380	19.8753	20.1089	20.2193	20.2559	20.2578	20.2598	20.2477	20.1310	19.7734	19.4087 (90)
Living area fraction	19.9229	20.0893	20.2921	20.4939	20.5958	20.6282	20.6306	20.6315	20.6213	20.5115	20.2008	0.5025 (91)
MIT	19.9229	20.0893	20.2921	20.4939	20.5958	20.6282	20.6306	20.6315	20.6213	20.5115	20.2008	19.8930 (92)
Temperature adjustment	19.9229	20.0893	20.2921	20.4939	20.5958	20.6282	20.6306	20.6315	20.6213	20.5115	20.2008	0.0000
adjusted MIT	19.9229	20.0893	20.2921	20.4939	20.5958	20.6282	20.6306	20.6315	20.6213	20.5115	20.2008	19.8930 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9848	0.9686	0.9332	0.8489	0.6986	0.4989	0.3472	0.3711	0.5830	0.8528	0.9648	0.9881 (94)
Useful gains	393.2768	434.0044	448.4366	424.1129	352.1053	242.2178	162.6060	170.1565	261.7406	360.3713	378.6361	376.4273 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	655.3093	635.2724	575.1552	476.4252	364.4698	243.3097	162.6839	170.2784	264.8045	406.0864	539.9450	650.6056 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	194.9522	135.2521	94.2787	37.6648	9.1992	0.0000	0.0000	0.0000	0.0000	34.0121	116.1424	203.9887 (98)
Space heating												825.4902 (98)
Space heating per m2												16.2530 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	825.4902 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	866.7647 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1920.6539 (310a)
Electricity used for heat distribution	27.8742 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	238.1302 (332)
Total delivered energy for all uses	3147.5400 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3114.4341	0.2160	672.7178 (367)
Electrical energy for heat distribution	27.8742	0.5190	14.4667 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			687.1845 (373)
Space and water heating			687.1845 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	238.1302	0.5190	123.5896 (379)
Total CO2, kg/year			874.0875 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			17.2100 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		17.2100 ZC1
Total Floor Area	TFA	50.7900
Assumed number of occupants	N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.4175 ZC2
CO2 emissions from cooking, equation (L16)		3.1526 ZC3
Total CO2 emissions		37.7801 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		37.7801 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	+	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test				20.0000 / (5) =	0.1575 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4075 (18)
					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)
External Wall	19.8500	8.4500	11.4000	0.1800	2.0520		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Main Roof	50.7900		50.7900	0.1300	6.6027		(30)
Total net area of external elements Aum(A, m ²)			88.1400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.5572		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.8980 (36)
Total fabric heat loss						(33) + (36) =	30.4552 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	24.3480	24.2160	24.0867	23.4794	23.3658	22.8368	22.8368	22.7389	23.0406	23.3658	23.5957	23.8360 (38)
Heat transfer coeff	54.8031	54.6712	54.5419	53.9346	53.8209	53.2920	53.2920	53.1940	53.4957	53.8209	54.0508	54.2911 (39)
Average = Sum(39)m / 12 =												53.9340 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0790	1.0764	1.0739	1.0619	1.0597	1.0493	1.0493	1.0473	1.0533	1.0597	1.0642	1.0689 (40)
HLP (average)												1.0619 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												

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Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
Heat gains from water heating, kWh/month	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782 (72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415 (73)

6. Solar gains

[Jan]		Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W					
Southeast		6.2400	36.7938	0.6300	0.7000	0.7700	70.1668 (77)					
South		2.2100	46.7521	0.6300	0.7000	0.7700	31.5766 (78)					
Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains	421.2115	488.9806	537.3716	569.4289	581.3281	561.5651	541.7662	526.3621	510.2428	468.0154	419.7157	398.8747 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	64.3592	64.5145	64.6674	65.3956	65.5337	66.1841	66.1841	66.3060	65.9321	65.5337	65.2550	64.9661
alpha	5.2906	5.3010	5.3112	5.3597	5.3689	5.4123	5.4123	5.4204	5.3955	5.3689	5.3503	5.3311
util living area	0.9910	0.9798	0.9549	0.8941	0.7738	0.5906	0.4302	0.4609	0.6835	0.9078	0.9799	0.9931 (86)
MIT	20.0675	20.2482	20.4792	20.7304	20.9047	20.9823	20.9973	20.9961	20.9617	20.7465	20.3613	20.0316 (87)
Th 2	20.0180	20.0201	20.0222	20.0321	20.0339	20.0425	20.0425	20.0441	20.0392	20.0339	20.0302	20.0263 (88)
util rest of house	0.9883	0.9738	0.9416	0.8642	0.7174	0.5094	0.3380	0.3672	0.6035	0.8752	0.9728	0.9910 (89)
MIT 2	18.7967	19.0581	19.3863	19.7340	19.9472	20.0315	20.0415	20.0426	20.0122	19.7637	19.2307	18.7509 (90)
Living area fraction	19.4352	19.6561	19.9355	20.2346	20.4283	20.5092	20.5218	20.5217	20.4893	20.2575	19.7988	0.5025 (91)
MIT	19.4352	19.6561	19.9355	20.2346	20.4283	20.5092	20.5218	20.5217	20.4893	20.2575	19.7988	19.3944 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4352	19.6561	19.9355	20.2346	20.4283	20.5092	20.5218	20.5217	20.4893	20.2575	19.7988	19.3944 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	415.3798	474.8243	505.2408	496.0153	431.0934	308.7200	208.2563	218.1346	327.7239	413.5580	407.4408	394.5505 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	829.4572	806.7324	732.7957	611.3287	469.7640	314.9151	208.9986	219.2486	341.7992	519.7751	686.3799	824.9231 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	308.0736	223.0422	169.3008	83.0256	28.7710	0.0000	0.0000	0.0000	0.0000	79.0255	200.8362	320.1972 (98)
Space heating												1412.2721 (98)
Space heating per m2										(98) / (4) =		27.8061 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1510.4515 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	308.0736	223.0422	169.3008	83.0256	28.7710	0.0000	0.0000	0.0000	0.0000	79.0255	200.8362	320.1972	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	329.4905	238.5478	181.0704	88.7974	30.7711	0.0000	0.0000	0.0000	0.0000	84.5192	214.7981	342.4569	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	86.3998	85.8889	85.0177	83.4531	81.4532	79.8000	79.8000	79.8000	79.8000	83.2504	85.5224	79.8000	(216)
Fuel for water heating, kWh/month	195.3304	173.4059	184.4973	169.2202	170.4436	156.2471	150.8144	164.4484	163.8315	175.8630	180.1216	190.5271	(219)
Water heating fuel used												2074.7506	(219)
Annual totals kWh/year													
Space heating fuel - main system												1510.4515	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												3903.5784	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1510.4515	0.2160	326.2575 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2074.7506	0.2160	448.1461 (264)
Space and water heating			774.4036 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			939.6410 (272)
Emissions per m2 for space and water heating			15.2472 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.2472 * 1.00) + 2.4870 + 0.7664, rounded to 2 d.p.			18.5000 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	106	Issued on Date	29/04/2022
Assessment Reference	106	Prop Type Ref	
Property			
SAP Rating	83 B	DER	18.25
Environmental	88 B	TER	19.61
CO ₂ Emissions (t/year)	0.79	% DER<TER	6.96
General Requirements Compliance	Fail	DFEE	42.30
		TFEE	48.19
		% DFEE<TFEE	12.22
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 19.61 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 18.25 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)48.2 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)42.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing South East:	6.24 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Windows facing South West:	1.97 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			10.4200	1.1450	11.9313		(27)
External Wall	39.4300	10.4200	29.0100	0.1500	4.3515		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Main Roof	50.7900		50.7900	0.1000	5.0790		(30)
Total net area of external elements Aum(A, m ²)			107.7200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	27.1543			(33)
Party Wall 1			17.0500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.4474 (36)
Total fabric heat loss						(33) + (36) =	35.6017 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	11.7351	11.6015	11.4680	10.8002	10.6666	9.9988	9.9988	9.8652	10.2659	10.6666	10.9337	11.2009 (38)
Average = Sum(39)m / 12 =	47.3368	47.2032	47.0697	46.4019	46.2683	45.6005	45.6005	45.4669	45.8676	46.2683	46.5354	46.8026 (39)
												46.3685 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9320	0.9294	0.9268	0.9136	0.9110	0.8978	0.8978	0.8952	0.9031	0.9110	0.9162	0.9215 (40)
Days in month												0.9129 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy content (annual)	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1178.3544 (45)
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)

Water storage loss:												
Store volume												
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0152 (51)											
Volume factor from Table 2a	1.0294 (52)											
Temperature factor from Table 2b	0.6000 (53)											
Enter (49) or (54) in (55)	1.0327 (55)											
Total storage loss												
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144	(56)											
If cylinder contains dedicated solar storage												
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144	(57)											
Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624	(59)											
Total heat required for water heating calculated for each month												
177.4469 156.7782 165.5372 149.6214 147.5136 133.0871 129.0318 139.9117 139.1394 155.0886 162.4461 173.5921	(62)											
Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 Solar input 0.0000 0.0000 0.0000 0.0000	(63)											
	Solar input (sum of months) = Sum(63)m =											
Output from w/h 177.4469 156.7782 165.5372 149.6214 147.5136 133.0871 129.0318 139.9117 139.1394 155.0886 162.4461 173.5921	(64)											
	Total per year (kWh/year) = Sum(64)m =											
Heat gains from water heating, kWh/month												
84.8430 75.4698 80.8830 74.7574 74.8902 69.2597 68.7450 72.3625 71.2721 77.4089 79.0216 83.5613	(65)											

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9849	0.9679	0.9319	0.8488	0.7016	0.5040	0.3505	0.3771	0.5951	0.8604	0.9661	0.9882 (94)
Useful gains	408.9448	460.0508	482.6091	463.3442	390.0167	270.6819	181.5878	190.0833	291.2007	389.4821	397.5887	389.8564 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	730.3022	709.1870	643.1383	533.8790	408.8427	272.7709	181.7747	190.3747	296.8182	454.3748	602.4526	725.1309 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	239.0899	167.4195	119.4337	50.7851	14.0065	0.0000	0.0000	0.0000	0.0000	48.2802	147.5020	249.4442 (98)
Space heating												1035.9611 (99)
Space heating per m2												20.3970 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	1035.9611	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1087.7592	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating:		
Annual water heating requirement	1829.1942	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1920.6539	(310a)
Electricity used for heat distribution	30.0841	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	121.9912	(330a)
Total electricity for the above, kWh/year	121.9912	(331)
Electricity for lighting (calculated in Appendix L)	235.0396	(332)
Total delivered energy for all uses	3365.4439	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3361.3554	0.2160	726.0528 (367)
Electrical energy for heat distribution	30.0841	0.5190	15.6137 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			741.6664 (373)
Space and water heating			741.6664 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	235.0396	0.5190	121.9856 (379)
Total CO2, kg/year			926.9654 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			18.2500 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		18.2500	ZC1
Total Floor Area	TFA	50.7900	
Assumed number of occupants	N	1.7134	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.4175	ZC2
CO2 emissions from cooking, equation (L16)		3.1526	ZC3
Total CO2 emissions		38.8201	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		38.8201	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	+	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1575 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4075 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3464 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4416	0.4330	0.4243	0.3810	0.3724	0.3291	0.3291	0.3204	0.3464	0.3724	0.3897	0.4070 (22b)
Effective ac	0.5975	0.5937	0.5900	0.5726	0.5693	0.5541	0.5541	0.5513	0.5600	0.5693	0.5759	0.5828 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			10.4200	1.3258	13.8144		(27)
External Wall	39.4300	10.4200	29.0100	0.1800	5.2218		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Main Roof	50.7900		50.7900	0.1300	6.6027		(30)
Total net area of external elements Aum(A, m ²)			107.7200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.3387		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.6479 (36)
Total fabric heat loss						(33) + (36) =	36.9866 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	25.0373	24.8786	24.7230	23.9925	23.8558	23.2195	23.2195	23.1017	23.4646	23.8558	24.1323	24.4214 (38)
Heat transfer coeff	62.0239	61.8652	61.7096	60.9791	60.8424	60.2061	60.2061	60.0883	60.4512	60.8424	61.1189	61.4080 (39)
Average = Sum(39)m / 12 =												60.9784 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2212	1.2181	1.2150	1.2006	1.1979	1.1854	1.1854	1.1831	1.1902	1.1979	1.2034	1.2091 (40)
HLP (average)												1.2006 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
Heat gains from water heating, kWh/month	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.3700	11.8751	9.6575	7.3113	5.4653	4.6140	4.9856	6.4805	8.6981	11.0443	12.8903	13.7416 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782 (72)
Total internal gains	319.0571	317.3814	307.6675	292.1267	276.6192	261.4435	251.4333	256.2414	264.0903	279.8021	297.8468	311.1191 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Southeast				6.2400	36.7938	0.6300	0.7000	0.7700	70.1668 (77)			
South				2.2100	46.7521	0.6300	0.7000	0.7700	31.5766 (78)			
Southwest				1.9700	36.7938	0.6300	0.7000	0.7700	22.1520 (79)			
Solar gains	123.8953	208.9673	281.0353	341.0471	376.1922	371.1129	358.7596	332.7706	301.7873	229.5768	148.0056	106.2907 (83)
Total gains	442.9525	526.3487	588.7027	633.1738	652.8114	632.5564	610.1929	589.0120	565.8776	509.3789	445.8524	417.4098 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)	21.0000 (85)											
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	56.8666	57.0124	57.1561	57.8409	57.9708	58.5835	58.5835	58.6984	58.3460	57.9708	57.7085	57.4369
alpha	4.7911	4.8008	4.8104	4.8561	4.8647	4.9056	4.9056	4.9132	4.8897	4.8647	4.8472	4.8291
util living area	0.9902	0.9774	0.9500	0.8860	0.7653	0.5870	0.4300	0.4631	0.6848	0.9057	0.9786	0.9924 (86)
MIT	19.9098	20.1204	20.3868	20.6759	20.8786	20.9743	20.9954	20.9934	20.9457	20.6858	20.2433	19.8705 (87)
Th 2	19.9031	19.9056	19.9080	19.9195	19.9217	19.9317	19.9317	19.9336	19.9278	19.9217	19.9173	19.9128 (88)
util rest of house	0.9870	0.9705	0.9349	0.8529	0.7042	0.4983	0.3278	0.3589	0.5979	0.8708	0.9709	0.9900 (89)
MIT 2	18.4846	18.7887	19.1665	19.5655	19.8129	19.9162	19.9302	19.9311	19.8903	19.5898	18.9772	18.4346 (90)
Living area fraction	19.2007	19.4578	19.7796	20.1234	20.3483	20.4478	20.4654	20.4649	20.4206	20.1405	19.6133	19.1561 (92)
Temperature adjustment	19.2007	19.4578	19.7796	20.1234	20.3483	20.4478	20.4654	20.4649	20.4206	20.1405	19.6133	19.1561 (93)
adjusted MIT	19.2007	19.4578	19.7796	20.1234	20.3483	20.4478	20.4654	20.4649	20.4206	20.1405	19.6133	19.1561 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9844	0.9670	0.9328	0.8598	0.7297	0.5422	0.3793	0.4114	0.6395	0.8788	0.9682	0.9878 (94)
Ext temp.	436.0529	508.9813	549.1400	544.4072	476.3684	342.9759	231.4431	242.3481	361.9026	447.6444	431.6522	412.3060 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Month fracti	924.2001	900.6226	819.4823	684.3953	526.1859	352.0754	232.7198	244.2507	382.0875	580.4667	764.8008	918.4241 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating per m2	363.1815	263.1829	201.1347	100.7914	37.0642	0.0000	0.0000	0.0000	0.0000	98.8198	239.8670	376.5519 (98)
Space heating	1680.5935 (98)											
Space heating per m2	(98) / (4) = 33.0891 (99)											

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1797.4262 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	363.1815	263.1829	201.1347	100.7914	37.0642	0.0000	0.0000	0.0000	0.0000	98.8198	239.8670	376.5519	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	388.4294	281.4791	215.1173	107.7983	39.6409	0.0000	0.0000	0.0000	0.0000	105.6896	256.5422	402.7293	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	86.8072	86.3173	85.4781	83.9329	81.8389	79.8000	79.8000	79.8000	79.8000	83.7922	85.9910	86.9492	(216)
Fuel for water heating, kWh/month	194.4136	172.5454	183.5035	168.2529	169.6403	156.2471	150.8144	164.4484	163.8315	174.7259	179.1400	189.6626	(219)
Water heating fuel used												2067.2255	(219)
Annual totals kWh/year													
Space heating fuel - main system												1797.4262	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												236.1179	(232)
Total delivered energy for all uses												4175.7696	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1797.4262	0.2160	388.2440 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2067.2255	0.2160	446.5207 (264)
Space and water heating			834.7648 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	236.1179	0.5190	122.5452 (268)
Total CO2, kg/m2/year			996.2349 (272)
Emissions per m2 for space and water heating			16.4356 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4128 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.4356 * 1.00) + 2.4128 + 0.7664, rounded to 2 d.p.			19.6100 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	107	Issued on Date	29/04/2022
Assessment Reference	107	Prop Type Ref	
Property			
SAP Rating	83 B	DER	17.81
Environmental	87 B	TER	19.54
CO ₂ Emissions (t/year)	1.03	% DER<TER	8.83
General Requirements Compliance	Pass	DFEE	48.02
		TFEE	56.74
		% DFEE<TFEE	15.36
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Ground-floor flat, total floor area 70 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 19.54 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 17.81 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)56.7 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)48.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing North East:	5.10 m ² , No overhang
Windows facing East:	2.21 m ² , No overhang
Windows facing South East:	6.24 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	70.0600 (1b)	x 2.8000 (2b)	= 196.1680 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 196.1680 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							2	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1275 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			13.5500	1.1450	15.5153		(27)					
Ground Floor			70.0600	0.1000	7.0060		(28a)					
External Wall	48.1900	13.5500	34.6400	0.1500	5.1960		(29a)					
Corridor	7.5900	1.8900	5.7000	0.2500	1.4250		(29a)					
Unheated	19.4900		19.4900	0.2000	3.8980		(29a)					
Total net area of external elements Aum(A, m2)			145.3300				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		34.9303		(33)					
Party Wall 1			24.1400	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.5810 (36)					
Total fabric heat loss							(33) + (36) = 46.5113 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 18.1300	Feb 17.9236	Mar 17.7173	Apr 16.6856	May 16.4792	Jun 15.4475	Jul 15.4475	Aug 15.2412	Sep 15.8602	Oct 16.4792	Nov 16.8919	Dec 17.3046 (38)
Heat transfer coeff	64.6412	64.4349	64.2285	63.1968	62.9905	61.9588	61.9588	61.7524	62.3714	62.9905	63.4032	63.8159 (39)
Average = Sum(39)m / 12 =	63.1452 (39)											
HLP	Jan 0.9227	Feb 0.9197	Mar 0.9168	Apr 0.9020	May 0.8991	Jun 0.8844	Jul 0.8844	Aug 0.8814	Sep 0.8903	Oct 0.8991	Nov 0.9050	Dec 0.9109 (40)
HLP (average)	0.9013 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2476 (42)
Average daily hot water use (litres/day)												87.5800 (43)
Daily hot water use	Jan 96.3380	Feb 92.8348	Mar 89.3316	Apr 85.8284	May 82.3252	Jun 78.8220	Jul 78.8220	Aug 82.3252	Sep 85.8284	Oct 89.3316	Nov 92.8348	Dec 96.3380 (44)
Energy conte	142.8665	124.9520	128.9393	112.4124	107.8623	93.0770	86.2495	98.9726	100.1546	116.7206	127.4096	138.3586 (45)
Energy content (annual)												Total = Sum(45)m = 1377.9751 (45)
Distribution loss (46)m = 0.15 x (45)m												

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Water storage loss:	21.4300	18.7428	19.3409	16.8619	16.1794	13.9616	12.9374	14.8459	15.0232	17.5081	19.1114	20.7538 (46)
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage												
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
Solar input	198.1433	174.8794	184.2161	165.9060	163.1391	146.5707	141.5263	154.2494	153.6483	171.9974	180.9033	193.6354 (62)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	Solar input (sum of months) = Sum (63)m =											0.0000 (63)
	198.1433	174.8794	184.2161	165.9060	163.1391	146.5707	141.5263	154.2494	153.6483	171.9974	180.9033	193.6354 (64)
	Total per year (kWh/year) = Sum (64)m =											2028.8148 (64)
Heat gains from water heating, kWh/month												
	91.7246	81.4885	87.0937	80.1721	80.0857	73.7430	72.8994	77.1298	76.0964	83.0310	85.1586	90.2257 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6053	15.6368	12.7167	9.6274	7.1966	6.0757	6.5650	8.5334	11.4535	14.5428	16.9736	18.0946 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.4371	199.4858	194.3230	183.3319	169.4576	156.4177	147.7062	145.6575	150.8203	161.8114	175.6857	188.7256 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032 (71)
Water heating gains (Table 5)	123.2857	121.2626	117.0615	111.3501	107.6420	102.4209	97.9831	103.6691	105.6894	111.6009	118.2759	121.2711 (72)
Total internal gains	395.0417	393.0990	380.8149	361.0230	341.0099	321.6279	308.9680	314.5737	324.6769	344.6688	367.6490	384.8050 (73)

6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains
		m2	Table 6a	or Table 6b	Specific data	factor	W
			W/m2		or Table 6c	Table 6d	
Northeast		5.1000	11.2829	0.4000	0.8000	0.7700	12.7607 (75)
East		2.2100	19.6403	0.4000	0.8000	0.7700	9.6255 (76)
Southeast		6.2400	36.7938	0.4000	0.8000	0.7700	50.9147 (77)

Solar gains	73.3009	131.5308	196.4709	269.1111	323.4206	330.3715	314.6758	272.9927	221.5768	149.9374	89.0422	61.9089 (83)
Total gains	468.3426	524.6299	577.2858	630.1342	664.4305	651.9994	623.6438	587.5663	546.2537	494.6062	456.6912	446.7139 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.2659	75.5069	75.7495	76.9861	77.2383	78.5245	78.7868	78.0049	77.2383	76.7356	76.2393	
alpha	6.0177	6.0338	6.0500	6.1324	6.1492	6.2350	6.2350	6.2525	6.2003	6.1492	6.1157	6.0826
util living area	0.9963	0.9919	0.9782	0.9283	0.8007	0.5972	0.4357	0.4808	0.7414	0.9497	0.9913	0.9972 (86)
MIT	20.1429	20.2766	20.4867	20.7476	20.9244	20.9899	20.9988	20.9978	20.9643	20.7396	20.3986	20.1217 (87)
Th 2	20.1483	20.1508	20.1533	20.1658	20.1683	20.1808	20.1808	20.1833	20.1758	20.1683	20.1633	20.1583 (88)
util rest of house	0.9951	0.9893	0.9713	0.9065	0.7510	0.5255	0.3554	0.3969	0.6700	0.9297	0.9881	0.9963 (89)
MIT 2	19.0046	19.2006	19.5048	19.8764	20.0975	20.1743	20.1803	20.1824	20.1491	19.8743	19.3885	18.9813 (90)
Living area fraction									fLA = Living area / (4) =			0.4129 (91)
MIT	19.4746	19.6449	19.9103	20.2361	20.4389	20.5111	20.5183	20.5191	20.4857	20.2316	19.8056	19.4522 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4746	19.6449	19.9103	20.2361	20.4389	20.5111	20.5183	20.5191	20.4857	20.2316	19.8056	19.4522 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9939	0.9874	0.9688	0.9086	0.7681	0.5549	0.3886	0.4316	0.6981	0.9315	0.9863	0.9952 (94)
Useful gains	465.4649	518.0003	559.3000	572.5145	510.3269	361.7711	242.3585	253.5944	381.3268	460.7171	450.4322	444.5873 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
	980.9059	950.0848	861.3240	716.4081	550.4693	366.2435	242.7723	254.3648	398.2864	606.7016	805.5749	973.3329 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
	383.4881	290.3608	224.7058	103.6033	29.8660	0.0000	0.0000	0.0000	0.0000	108.6124	255.7027	393.3867 (98)
Space heating												1789.7259 (98)
Space heating per m2												(98) / (4) = 25.5456 (99)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1789.7259 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1879.2122 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2028.8148 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2130.2556 (310a)
Electricity used for heat distribution	40.0947 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	188.4684 (330a)
Total electricity for the above, kWh/year	188.4684 (331)
Electricity for lighting (calculated in Appendix L)	310.9145 (332)
Total delivered energy for all uses	4508.8507 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	4479.8523	0.2160	967.6481 (367)
Electrical energy for heat distribution	40.0947	0.5190	20.8091 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			988.4572 (373)
Space and water heating			988.4572 (376)
Pumps and fans	188.4684	0.5190	97.8151 (378)
Energy for lighting	310.9145	0.5190	161.3646 (379)
Total CO2, kg/year			1247.6369 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			17.8100 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		17.8100 ZC1
Total Floor Area	TFA	70.0600
Assumed number of occupants	N	2.2476
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.6996 ZC2
CO2 emissions from cooking, equation (L16)		2.4685 ZC3
Total CO2 emissions		36.9780 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		36.9780 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	70.0600 (1b)	x 2.8000 (2b)	= 196.1680 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 196.1680 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1529 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4029 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3425 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4367	0.4281	0.4196	0.3767	0.3682	0.3254	0.3254	0.3168	0.3425	0.3682	0.3853	0.4024 (22b)
	0.5953	0.5916	0.5880	0.5710	0.5678	0.5529	0.5529	0.5502	0.5586	0.5678	0.5742	0.5810 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			13.5500	1.3258	17.9640			(27)					
Ground Floor			70.0600	0.1300	9.1078			(28a)					
External Wall	48.1900	13.5500	34.6400	0.1800	6.2352			(29a)					
Corridor	7.5900	1.8900	5.7000	0.1800	1.0260			(29a)					
Unheated	19.4900		19.4900	0.1800	3.5082			(29a)					
Total net area of external elements Aum(A, m2)			145.3300					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.7312			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.5490	(36)					
Total fabric heat loss						(33) + (36) =	49.2802	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 38.5398	Feb 38.3001	Mar 38.0652	Apr 36.9618	May 36.7553	Jun 35.7943	Jul 35.7943	Aug 35.6163	Sep 36.1644	Oct 36.7553	Nov 37.1730	Dec 37.6096	(38)
Heat transfer coeff	87.8200	87.5803	87.3454	86.2420	86.0355	85.0745	85.0745	84.8965	85.4447	86.0355	86.4532	86.8898	(39)
Average = Sum(39)m / 12 =												86.2410	(39)
HLP	Jan 1.2535	Feb 1.2501	Mar 1.2467	Apr 1.2310	May 1.2280	Jun 1.2143	Jul 1.2143	Aug 1.2118	Sep 1.2196	Oct 1.2280	Nov 1.2340	Dec 1.2402	(40)
HLP (average)												1.2310	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2476 (42)
Average daily hot water use (litres/day)												87.5800 (43)
Daily hot water use	96.3380	92.8348	89.3316	85.8284	82.3252	78.8220	78.8220	82.3252	85.8284	89.3316	92.8348	96.3380 (44)
Energy conte	142.8665	124.9520	128.9393	112.4124	107.8623	93.0770	86.2495	98.9726	100.1546	116.7206	127.4096	138.3586 (45)
Energy content (annual)										Total = Sum(45)m =		1377.9751 (45)
Distribution loss (46)m = 0.15 x (45)m												
21.4300	18.7428	19.3409	16.8619	16.1794	13.9616	12.9374	14.8459	15.0232	17.5081	19.1114	20.7538 (46)	
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

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Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage												
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
	189.4614	167.0377	175.5342	157.5042	154.4572	138.1688	132.8444	145.5675	145.2465	163.3155	172.5015	184.9535 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	189.4614	167.0377	175.5342	157.5042	154.4572	138.1688	132.8444	145.5675	145.2465	163.3155	172.5015	184.9535 (64)
Heat gains from water heating, kWh/month	84.7790	75.2151	80.1482	73.4506	73.1402	67.0216	65.9539	70.1843	69.3749	76.0855	78.4372	83.2802 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.7939	15.8044	12.8530	9.7305	7.2737	6.1408	6.6353	8.6248	11.5762	14.6987	17.1555	18.2884	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.4371	199.4858	194.3230	183.3319	169.4576	156.4177	147.7062	145.6575	150.8203	161.8114	175.6857	188.7256	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	(71)
Water heating gains (Table 5)	113.9503	111.9272	107.7261	102.0147	98.3067	93.0855	88.6477	94.3337	96.3540	102.2655	108.9405	111.9357	(72)
Total internal gains	388.8950	386.9312	374.6158	354.7908	334.7516	315.3577	302.7030	308.3297	318.4643	338.4893	361.4955	378.6635	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
Northeast					5.1000	11.2829	0.6300	0.7000	0.7700		17.5859 (75)	
East					2.2100	19.6403	0.6300	0.7000	0.7700		13.2651 (76)	
Southeast					6.2400	36.7938	0.6300	0.7000	0.7700		70.1668 (77)	
Solar gains	101.0178	181.2659	270.7614	370.8688	445.7141	455.2932	433.6626	376.2180	305.3606	206.6324	122.7113	85.3182 (83)
Total gains	489.9128	568.1971	645.3772	725.6596	780.4657	770.6509	736.3655	684.5478	623.8248	545.1217	484.2067	463.9817 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	55.4006	55.5522	55.7016	56.4143	56.5496	57.1885	57.1885	57.3083	56.9407	56.5496	56.2765	55.9937
alpha	4.6934	4.7035	4.7134	4.7610	4.7700	4.8126	4.8126	4.8206	4.7960	4.7700	4.7518	4.7329
util living area	0.9961	0.9916	0.9791	0.9384	0.8368	0.6616	0.4985	0.5535	0.8033	0.9610	0.9920	0.9970 (86)
MIT	19.7125	19.8855	20.1640	20.5210	20.8057	20.9541	20.9904	20.9846	20.8829	20.5098	20.0476	19.6849 (87)
Th 2	19.8774	19.8801	19.8828	19.8953	19.8976	19.9086	19.9086	19.9106	19.9044	19.8976	19.8929	19.8880 (88)
util rest of house	0.9948	0.9888	0.9718	0.9164	0.7824	0.5666	0.3799	0.4309	0.7213	0.9426	0.9888	0.9960 (89)
MIT 2	18.1804	18.4338	18.8376	19.3473	19.7143	19.8796	19.9053	19.9046	19.8152	19.3438	18.6800	18.1475 (90)
Living area fraction									fLA = Living area / (4) =			0.4129 (91)
MIT	18.8130	19.0332	19.3853	19.8320	20.1650	20.3233	20.3534	20.3506	20.2561	19.8253	19.2447	18.7824 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8130	19.0332	19.3853	19.8320	20.1650	20.3233	20.3534	20.3506	20.2561	19.8253	19.2447	18.7824 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9930	0.9859	0.9676	0.9149	0.7969	0.6044	0.4292	0.4818	0.7503	0.9411	0.9862	0.9945	(94)
Useful gains	486.5050	560.2110	624.4888	663.9350	621.9564	465.7687	316.0462	329.8118	468.0326	513.0002	477.5337	461.4414	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1274.5352	1237.7912	1125.4727	942.7931	728.2893	486.9050	319.3147	335.3884	526.0032	793.7002	1049.9508	1267.0589	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	586.2945	455.3339	372.7321	200.7779	79.1116	0.0000	0.0000	0.0000	0.0000	208.8408	412.1403	599.3794	(98)
Space heating												2914.6105	(98)
Space heating per m2												41.6016	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												3117.2304 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	586.2945	455.3339	372.7321	200.7779	79.1116	0.0000	0.0000	0.0000	0.0000	208.8408	412.1403	599.3794 (98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000 (210)
Space heating fuel (main heating system)	627.0529	486.9882	398.6439	214.7357	84.6114	0.0000	0.0000	0.0000	0.0000	223.3591	440.7918	641.0475 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	189.4614	167.0377	175.5342	157.5042	154.4572	138.1688	132.8444	145.5675	145.2465	163.3155	172.5015	184.9535 (64)
Efficiency of water heater (217)m	87.6303	87.3563	86.7748	85.4624	83.1290	79.8000	79.8000	79.8000	79.8000	85.4708	87.0559	79.8000 (216)
Fuel for water heating, kWh/month	216.2053	191.2142	202.2869	184.2965	185.8043	173.1439	166.4717	182.4154	182.0131	191.0776	198.1503	210.8304 (219)
Water heating fuel used												2283.9097 (219)
Annual totals kWh/year												
Space heating fuel - main system												3117.2304 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												314.2458 (232)
Total delivered energy for all uses												5790.3860 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3117.2304	0.2160	673.3218 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2283.9097	0.2160	493.3245 (264)
Space and water heating			1166.6463 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	314.2458	0.5190	163.0936 (268)
Total CO2, kg/m2/year			1368.6649 (272)
Emissions per m2 for space and water heating			16.6521 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3279 (272b)
Emissions per m2 for pumps and fans			0.5556 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.6521 * 1.00) + 2.3279 + 0.5556, rounded to 2 d.p.			19.5400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	108	Issued on Date	29/04/2022
Assessment Reference	108	Prop Type Ref	
Property			
SAP Rating	82 B	DER	19.21
Environmental	88 B	TER	20.60
CO ₂ Emissions (t/year)	0.82	% DER<TER	6.73
General Requirements Compliance	Pass	DFEE	47.31
		TFEE	52.61
		% DFEE<TFEE	10.07
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Ground-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 20.60 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 19.21 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 52.6 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 47.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing South East:	6.24 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.9000 (1b)	x 2.8000 (2b)	= 142.5200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 142.5200 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)							
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)							
Number of intermittent fans					0 * 10 = 0.0000 (7a)							
Number of passive vents					0 * 10 = 0.0000 (7b)							
Number of flueless gas fires					0 * 40 = 0.0000 (7c)							
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)							
Pressure test					Yes							
Measured/design AP50					3.0000							
Infiltration rate					0.1500 (18)							
Number of sides sheltered					3 (19)							
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)							
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1163 (21)							
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)					
Ground Floor			50.9000	0.1000	5.0900		(28a)					
External Wall	22.0900	8.4500	13.6400	0.1500	2.0460		(29a)					
Corridor	19.5200	1.8900	17.6300	0.2500	4.4075		(29a)					
Unheated	18.4000		18.4000	0.2000	3.6800		(29a)					
Total net area of external elements Aum(A, m2)			110.9100				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		26.7891		(33)					
Party Wall 1			23.4400	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.2840 (36)					
Total fabric heat loss						(33) + (36) =	36.0731 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 12.4972	Feb 12.3605	Mar 12.2238	Apr 11.5404	May 11.4037	Jun 10.7203	Jul 10.7203	Aug 10.5836	Sep 10.9936	Oct 11.4037	Nov 11.6771	Dec 11.9504 (38)
Heat transfer coeff	48.5703	48.4336	48.2969	47.6135	47.4768	46.7933	46.7933	46.6567	47.0667	47.4768	47.7501	48.0235 (39)
Average = Sum(39)m / 12 =												47.5793 (39)
HLP	Jan 0.9542	Feb 0.9515	Mar 0.9489	Apr 0.9354	May 0.9327	Jun 0.9193	Jul 0.9193	Aug 0.9166	Sep 0.9247	Oct 0.9327	Nov 0.9381	Dec 0.9435 (40)
HLP (average)												0.9348 (40)
Days in month												
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7166 (42)
Average daily hot water use (litres/day)												74.9698 (43)
Daily hot water use	Jan 82.4667	Feb 79.4680	Mar 76.4692	Apr 73.4704	May 70.4716	Jun 67.4728	Jul 67.4728	Aug 70.4716	Sep 73.4704	Oct 76.4692	Nov 79.4680	Dec 82.4667 (44)
Energy conte	122.2958	106.9607	110.3739	96.2266	92.3317	79.6752	73.8308	84.7220	85.7338	99.9145	109.0645	118.4370 (45)
Energy content (annual)												Total = Sum(45)m = 1179.5664 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Water storage loss:	18.3444	16.0441	16.5561	14.4340	13.8498	11.9513	11.0746	12.7083	12.8601	14.9872	16.3597	17.7655 (46)
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage												
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
	177.5726	156.8881	165.6507	149.7203	147.6085	133.1689	129.1076	139.9988	139.2275	155.1913	162.5582	173.7138 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h												
	177.5726	156.8881	165.6507	149.7203	147.6085	133.1689	129.1076	139.9988	139.2275	155.1913	162.5582	173.7138 (64)
Heat gains from water heating, kWh/month												
	84.8848	75.5064	80.9207	74.7903	74.9217	69.2870	68.7702	72.3915	71.3014	77.4430	79.0589	83.6017 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	85.8311	85.8311	85.8311	85.8311	85.8311	85.8311	85.8311	85.8311	85.8311	85.8311	85.8311	85.8311 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	13.5136	12.0027	9.7613	7.3899	5.5240	4.6636	5.0392	6.5502	8.7916	11.1630	13.0288	13.8892 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	149.5712	151.1232	147.2120	138.8856	128.3749	118.4964	111.8969	110.3448	114.2560	122.5825	133.0931	142.9717 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	31.5831	31.5831	31.5831	31.5831	31.5831	31.5831	31.5831	31.5831	31.5831	31.5831	31.5831	31.5831 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-68.6649	-68.6649	-68.6649	-68.6649	-68.6649	-68.6649	-68.6649	-68.6649	-68.6649	-68.6649	-68.6649	-68.6649 (71)
Water heating gains (Table 5)												
	114.0925	112.3607	108.7644	103.8754	100.7013	96.2319	92.4331	97.3004	99.0298	104.0901	109.8040	112.3679 (72)
Total internal gains												
	325.9266	324.2360	314.4871	298.9002	283.3495	268.1412	258.1185	262.9447	270.8267	286.5848	304.6753	317.9782 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d				Gains W
Southeast				6.2400	36.7938	0.4000	0.8000	0.7700				50.9147 (77)
South				2.2100	46.7521	0.4000	0.8000	0.7700				22.9127 (78)
Solar gains	73.8274	124.2516	166.4633	201.0539	220.9821	217.6723	210.5612	195.8614	178.4200	136.3256	88.1434	63.3710 (83)
Total gains	399.7540	448.4876	480.9504	499.9541	504.3316	485.8136	468.6797	458.8061	449.2467	422.9104	392.8187	381.3492 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	72.7755	72.9808	73.1874	74.2379	74.4516	75.5390	75.5390	75.7603	75.1003	74.4516	74.0254	73.6040
alpha	5.8517	5.8654	5.8792	5.9492	5.9634	6.0359	6.0359	6.0507	6.0067	5.9634	5.9350	5.9069
util living area	0.9919	0.9831	0.9628	0.9093	0.7938	0.6033	0.4376	0.4653	0.6911	0.9137	0.9814	0.9937 (86)
MIT	20.2067	20.3513	20.5456	20.7666	20.9209	20.9877	20.9984	20.9978	20.9725	20.7937	20.4660	20.1797 (87)
Th 2	20.1217	20.1239	20.1262	20.1375	20.1398	20.1511	20.1511	20.1534	20.1466	20.1398	20.1352	20.1307 (88)
util rest of house												
	0.9894	0.9781	0.9518	0.8835	0.7426	0.5289	0.3541	0.3810	0.6179	0.8840	0.9750	0.9917 (89)
MIT 2	19.0765	19.2864	19.5642	19.8749	20.0662	20.1432	20.1505	20.1525	20.1268	19.9173	19.4621	19.0444 (90)
Living area fraction									fLA = Living area / (4) =			0.5000 (91)
MIT	19.6416	19.8188	20.0549	20.3208	20.4935	20.5654	20.5745	20.5751	20.5497	20.3555	19.9641	19.6120 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6416	19.8188	20.0549	20.3208	20.4935	20.5654	20.5745	20.5751	20.5497	20.3555	19.9641	19.6120 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9877	0.9760	0.9508	0.8895	0.7647	0.5658	0.3959	0.4232	0.6535	0.8923	0.9734	0.9903 (94)
Useful gains	394.8402	437.7079	457.2880	444.6939	385.6563	274.8671	185.5552	194.1673	293.5777	377.3470	382.3773	377.6323 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
	745.1459	722.5727	654.6607	543.7824	417.4873	279.1429	185.9795	194.7974	303.5646	463.1610	614.2618	740.1401 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
	260.6274	191.4291	146.8453	71.3437	23.6823	0.0000	0.0000	0.0000	0.0000	63.8456	166.9568	269.7058 (98)
Space heating												
Space heating per m2												
												1194.4360 (98)
												(98) / (4) = 23.4663 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	1194.4360	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1254.1578	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating:		
Annual water heating requirement	1830.4062	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1921.9265	(310a)
Electricity used for heat distribution	31.7608	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	136.9261	(330a)
Total electricity for the above, kWh/year	136.9261	(331)
Electricity for lighting (calculated in Appendix L)	238.6552	(332)
Total delivered energy for all uses	3551.6656	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3548.6976	0.2160	766.5187 (367)
Electrical energy for heat distribution	31.7608	0.5190	16.4839 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			783.0026 (373)
Space and water heating			783.0026 (376)
Pumps and fans	136.9261	0.5190	71.0646 (378)
Energy for lighting	238.6552	0.5190	123.8621 (379)
Total CO2, kg/year			977.9292 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			19.2100 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		19.2100	ZC1
Total Floor Area	TFA	50.9000	
Assumed number of occupants	N	1.7166	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.4131	ZC2
CO2 emissions from cooking, equation (L16)		3.1473	ZC3
Total CO2 emissions		39.7704	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		39.7704	ZC8

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.9000 (1b)	x 2.8000 (2b)	= 142.5200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 142.5200 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1403 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3903 (18)
					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3025 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.3857	0.3781	0.3706	0.3328	0.3252	0.2874	0.2874	0.2798	0.3025	0.3252	0.3403	0.3554 (22b)
Effective ac	0.5744	0.5715	0.5687	0.5554	0.5529	0.5413	0.5413	0.5391	0.5458	0.5529	0.5579	0.5632 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)					
Ground Floor			50.9000	0.1300	6.6170		(28a)					
External Wall	22.0900	8.4500	13.6400	0.1800	2.4552		(29a)					
Corridor	19.5200	1.8900	17.6300	0.1800	3.1734		(29a)					
Unheated	18.4000		18.4000	0.1800	3.3120		(29a)					
Total net area of external elements Aum(A, m2)			110.9100				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.6503		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.7195 (36)					
Total fabric heat loss						(33) + (36) =	36.3698 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	27.0140	26.8782	26.7451	26.1196	26.0026	25.4579	25.4579	25.3571	25.6677	26.0026	26.2393	26.4868 (38)
Heat transfer coeff	63.3838	63.2480	63.1148	62.4894	62.3724	61.8277	61.8277	61.7268	62.0375	62.3724	62.6091	62.8566 (39)
Average = Sum(39)m / 12 =												62.4888 (39)
HLP	1.2453	1.2426	1.2400	1.2277	1.2254	1.2147	1.2147	1.2127	1.2188	1.2254	1.2300	1.2349 (40)
HLP (average)												1.2277 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7166 (42)
Average daily hot water use (litres/day)												74.9698 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	82.4667	79.4680	76.4692	73.4704	70.4716	67.4728	67.4728	70.4716	73.4704	76.4692	79.4680	82.4667 (44)
Energy conte	122.2958	106.9607	110.3739	96.2266	92.3317	79.6752	73.8308	84.7220	85.7338	99.9145	109.0645	118.4370 (45)
Energy content (annual)											Total = Sum(45)m =	1179.5664 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3444	16.0441	16.5561	14.4340	13.8498	11.9513	11.0746	12.7083	12.8601	14.9872	16.3597	17.7655 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

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Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	168.8907	149.0464	156.9688	141.3184	138.9266	124.7671	120.4257	131.3169	130.8256	146.5094	154.1563	165.0319 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	168.8907	149.0464	156.9688	141.3184	138.9266	124.7671	120.4257	131.3169	130.8256	146.5094	154.1563	165.0319 (64)
Heat gains from water heating, kWh/month	77.9393	69.2330	73.9752	68.0688	67.9762	62.5655	61.8247	65.4460	64.5800	70.4975	72.3374	76.6562 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	85.8311	85.8311	85.8311	85.8311	85.8311	85.8311	85.8311	85.8311	85.8311	85.8311	85.8311	85.8311	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.8129	12.2685	9.9774	7.5536	5.6464	4.7669	5.1508	6.6952	8.9863	11.4102	13.3174	14.1968	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.5712	151.1232	147.2120	138.8856	128.3749	118.4964	111.8969	110.3448	114.2560	122.5825	133.0931	142.9717	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5831	31.5831	31.5831	31.5831	31.5831	31.5831	31.5831	31.5831	31.5831	31.5831	31.5831	31.5831	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.6649	-68.6649	-68.6649	-68.6649	-68.6649	-68.6649	-68.6649	-68.6649	-68.6649	-68.6649	-68.6649	-68.6649	(71)
Water heating gains (Table 5)	104.7571	103.0253	99.4291	94.5400	91.3659	86.8965	83.0977	87.9650	89.6944	94.7547	100.4686	103.0325	(72)
Total internal gains	319.8905	318.1664	308.3679	292.7285	277.1365	261.9091	251.8947	256.7544	264.6860	280.4967	298.6285	311.9504	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
Southeast					6.2400	36.7938	0.6300	0.7000			0.7700	70.1668 (77)
South					2.2100	46.7521	0.6300	0.7000			0.7700	31.5766 (78)
Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains	421.6339	489.4006	537.7751	569.8059	581.6774	561.8888	542.0744	526.6759	510.5711	468.3704	420.1011	399.2836 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	55.7670	55.8867	56.0046	56.5652	56.6713	57.1706	57.1706	57.2640	56.9772	56.6713	56.4570	56.2347
alpha	4.7178	4.7258	4.7336	4.7710	4.7781	4.8114	4.8114	4.8176	4.7985	4.7781	4.7638	4.7490
util living area	0.9921	0.9835	0.9651	0.9206	0.8258	0.6599	0.4926	0.5261	0.7476	0.9308	0.9837	0.9938 (86)
MIT	19.8389	20.0256	20.2808	20.5787	20.8185	20.9546	20.9909	20.9875	20.9155	20.6129	20.1688	19.8023 (87)
Th 2	19.8840	19.8861	19.8882	19.8979	19.8997	19.9083	19.9083	19.9098	19.9050	19.8997	19.8960	19.8922 (88)
util rest of house	0.9896	0.9782	0.9537	0.8943	0.7698	0.5650	0.3752	0.4080	0.6605	0.9023	0.9775	0.9918 (89)
MIT 2	18.3685	18.6394	19.0051	19.4244	19.7301	19.8796	19.9051	19.9051	19.8439	19.4800	18.8559	18.3211 (90)
Living area fraction									fLA = Living area / (4) =			0.5000 (91)
MIT	19.1037	19.3325	19.6430	20.0015	20.2743	20.4171	20.4480	20.4463	20.3797	20.0465	19.5124	19.0617 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1037	19.3325	19.6430	20.0015	20.2743	20.4171	20.4480	20.4463	20.3797	20.0465	19.5124	19.0617 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9872	0.9749	0.9507	0.8971	0.7905	0.6110	0.4342	0.4673	0.7006	0.9067	0.9747	0.9898	(94)
Ext temp.	416.2476	477.1239	511.2550	511.1635	459.7921	343.3036	235.3523	246.1083	357.7226	424.6916	409.4918	395.2157	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	938.3139	912.8278	829.5152	693.7286	534.7977	359.6565	237.9130	249.7648	389.5749	589.1978	777.1272	934.1564	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m ²	388.4174	292.7930	236.7855	131.4469	55.8041	0.0000	0.0000	0.0000	0.0000	122.3926	264.6975	400.9719	(98)
												1893.3090	(98)
												37.1966	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2024.9294 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	388.4174	292.7930	236.7855	131.4469	55.8041	0.0000	0.0000	0.0000	0.0000	122.3926	264.6975	400.9719	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	415.4197	313.1476	253.2466	140.5849	59.6836	0.0000	0.0000	0.0000	0.0000	130.9012	283.0989	428.8470	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.8907	149.0464	156.9688	141.3184	138.9266	124.7671	120.4257	131.3169	130.8256	146.5094	154.1563	165.0319	(64)
Efficiency of water heater (217)m	86.9662	86.5837	85.9080	84.6214	82.5986	79.8000	79.8000	79.8000	79.8000	84.3386	86.2439	87.0950	(216)
Fuel for water heating, kWh/month	194.2027	172.1414	182.7173	167.0008	168.1949	156.3497	150.9094	164.5575	163.9419	173.7157	178.7445	189.4850	(219)
Water heating fuel used												2061.9607	(219)
Annual totals kWh/year													
Space heating fuel - main system												2024.9294	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.9409	(232)
Total delivered energy for all uses												4405.8310	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2024.9294	0.2160	437.3848 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2061.9607	0.2160	445.3835 (264)
Space and water heating			882.7683 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.9409	0.5190	126.6053 (268)
Total CO2, kg/m2/year			1048.2986 (272)
Emissions per m2 for space and water heating			17.3432 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4873 (272b)
Emissions per m2 for pumps and fans			0.7647 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.3432 * 1.00) + 2.4873 + 0.7647, rounded to 2 d.p.			20.6000 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	109			Issued on Date	29/04/2022
Assessment Reference	109	Prop Type Ref			
Property					
SAP Rating	81 B	DER	21.87	TER	20.92
Environmental	86 B	% DER<TER	-4.56		
CO ₂ Emissions (t/year)	0.93	DFEE	57.66	TFEE	54.20
General Requirements Compliance	Fail	% DFEE<TFEE	-6.39		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Ground-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Mains gas (c)
Fuel factor: 1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 20.92 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 21.87 kgCO₂/m² Fail
Excess emissions = 0.95 kgCO₂/m² (4.5%)

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 54.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 57.7 kWh/m²/yr Fail
Excess energy = 3.5 kWh/m²/yr (6.5%)

2 Fabric U-values

Element	Average	Highest	
External wall	0.22 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room stats OK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading: Average
Windows facing South East: 6.24 m², No overhang
Windows facing South: 2.21 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Floor U-value 0.10 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7500 (1b)	x 2.8000 (2b)	= 142.1000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 142.1000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)
Ground Floor			50.7500	0.1000	5.0750		(28a)
External Wall	25.7600	8.4500	17.3100	0.1500	2.5965		(29a)
Corridor	39.2300	1.8900	37.3400	0.2500	9.3350		(29a)
Total net area of external elements Aum(A, m2)			115.7400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		28.5721		(33)
Party Wall 1			18.4000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.3776 (36)
Total fabric heat loss						(33) + (36) =	44.9497 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	12.4603	12.3241	12.1878	11.5064	11.3701	10.6887	10.6887	10.5524	10.9612	11.3701	11.6427	11.9152 (38)
Heat transfer coeff	57.4100	57.2737	57.1375	56.4560	56.3198	55.6383	55.6383	55.5021	55.9109	56.3198	56.5923	56.8649 (39)
Average = Sum(39)m / 12 =												56.4220 (39)
HLP	1.1312	1.1285	1.1259	1.1124	1.1097	1.0963	1.0963	1.0936	1.1017	1.1097	1.1151	1.1205 (40)
HLP (average)												1.1118 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7122 (42)
Average daily hot water use (litres/day)												74.8647 (43)
Daily hot water use	82.3512	79.3566	76.3620	73.3674	70.3728	67.3783	67.3783	70.3728	73.3674	76.3620	79.3566	82.3512 (44)
Energy conte	122.1245	106.8108	110.2192	96.0918	92.2023	79.5636	73.7274	84.6032	85.6137	99.7745	108.9117	118.2710 (45)
Energy content (annual)												Total = Sum(45)m = 1177.9137 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3187	16.0216	16.5329	14.4138	13.8304	11.9345	11.0591	12.6905	12.8421	14.9662	16.3367	17.7407 (46)

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	177.4013	156.7383	165.4960	149.5855	147.4791	133.0573	129.0042	139.8801	139.1074	155.0513	162.4053	173.5478	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum (63)m =					0.0000 (63)
Output from w/h	177.4013	156.7383	165.4960	149.5855	147.4791	133.0573	129.0042	139.8801	139.1074	155.0513	162.4053	173.5478	(64)
								Total per year (kWh/year) = Sum (64)m =					1828.7535 (64)
Heat gains from water heating, kWh/month													
	84.8278	75.4565	80.8693	74.7455	74.8787	69.2498	68.7358	72.3520	71.2615	77.3965	79.0081	83.5466	(65)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9891	0.9802	0.9618	0.9180	0.8223	0.6424	0.4586	0.4896	0.7261	0.9200	0.9784	0.9912 (94)
Useful gains	394.8493	439.0378	462.0365	458.5003	414.3220	311.7874	214.7429	224.4100	325.8605	388.6257	383.8323	377.4573 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	860.0487	834.3519	756.3511	630.3826	485.7987	326.5137	216.8492	227.3692	354.1579	536.5997	710.3815	855.7494 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	346.1084	265.6511	218.9700	123.7552	53.1786	0.0000	0.0000	0.0000	0.0000	110.0927	235.1154	355.8494 (98)
Space heating												1708.7207 (98)
Space heating per m2												33.6694 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1708.7207 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1794.1568 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1828.7535 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1920.1911 (310a)
Electricity used for heat distribution	37.1435 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	136.5226 (330a)
Total electricity for the above, kWh/year	136.5226 (331)
Electricity for lighting (calculated in Appendix L)	237.9395 (332)
Total delivered energy for all uses	4088.8100 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	4150.1094	0.2160	896.4236 (367)
Electrical energy for heat distribution	37.1435	0.5190	19.2775 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			915.7011 (373)
Space and water heating			915.7011 (376)
Pumps and fans	136.5226	0.5190	70.8552 (378)
Energy for lighting	237.9395	0.5190	123.4906 (379)
Total CO2, kg/year			1110.0469 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			21.8700 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		21.8700 ZC1
Total Floor Area	TFA	50.7500
Assumed number of occupants	N	1.7122
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.4191 ZC2
CO2 emissions from cooking, equation (L16)		3.1545 ZC3
Total CO2 emissions		42.4436 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		42.4436 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7500 (1b)	x 2.8000 (2b)	= 142.1000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 142.1000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1407 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3907 (18)
					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3028 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.3861	0.3785	0.3710	0.3331	0.3255	0.2877	0.2877	0.2801	0.3028	0.3255	0.3407	0.3558 (22b)
	0.5745	0.5716	0.5688	0.5555	0.5530	0.5414	0.5414	0.5392	0.5459	0.5530	0.5580	0.5633 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)
Ground Floor			50.7500	0.1300	6.5975		(28a)
External Wall	25.7600	8.4500	17.3100	0.1800	3.1158		(29a)
Corridor	39.2300	1.8900	37.3400	0.1800	6.7212		(29a)
Total net area of external elements Aum(A, m ²)			115.7400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.5272		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.9849 (36)
Total fabric heat loss						(33) + (36) =	37.5121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	26.9419	26.8061	26.6731	26.0482	25.9313	25.3870	25.3870	25.2862	25.5967	25.9313	26.1678	26.4151 (38)
Heat transfer coeff	64.4539	64.3182	64.1851	63.5602	63.4433	62.8991	62.8991	62.7983	63.1087	63.4433	63.6798	63.9271 (39)
Average = Sum(39)m / 12 =												63.5597 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2700	1.2674	1.2647	1.2524	1.2501	1.2394	1.2394	1.2374	1.2435	1.2501	1.2548	1.2596 (40)
HLP (average)												1.2524 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7122 (42)
Average daily hot water use (litres/day)												74.8647 (43)
Daily hot water use	82.3512	79.3566	76.3620	73.3674	70.3728	67.3783	67.3783	70.3728	73.3674	76.3620	79.3566	82.3512 (44)
Energy conte	122.1245	106.8108	110.2192	96.0918	92.2023	79.5636	73.7274	84.6032	85.6137	99.7745	108.9117	118.2710 (45)
Energy content (annual)												Total = Sum(45)m = 1177.9137 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3187	16.0216	16.5329	14.4138	13.8304	11.9345	11.0591	12.6905	12.8421	14.9662	16.3367	17.7407 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	168.7194	148.8965	156.8141	141.1836	138.7972	124.6555	120.3223	131.1982	130.7055	146.3694	154.0035	164.8659 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) =	Sum(63)m =											0.0000 (63)
Output from w/h	168.7194	148.8965	156.8141	141.1836	138.7972	124.6555	120.3223	131.1982	130.7055	146.3694	154.0035	164.8659 (64)
Heat gains from water heating, kWh/month	77.8823	69.1832	73.9238	68.0240	67.9332	62.5284	61.7903	65.4065	64.5400	70.4509	72.2866	76.6010 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7694	12.2298	9.9460	7.5297	5.6286	4.7519	5.1346	6.6741	8.9580	11.3742	13.2754	14.1520	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.1817	150.7297	146.8287	138.5239	128.0406	118.1878	111.6055	110.0575	113.9585	122.2633	132.7466	142.5994	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	(71)
Water heating gains (Table 5)	104.6805	102.9512	99.3600	94.4778	91.3081	86.8450	83.0514	87.9120	89.6389	94.6921	100.3981	102.9584	(72)
Total internal gains	319.3145	317.5937	307.8176	292.2144	276.6602	261.4676	251.4745	256.3265	264.2383	280.0126	298.1030	311.3928	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W	
Southeast				6.2400	36.7938	0.6300		0.7000		0.7700	70.1668 (77)	
South				2.2100	46.7521	0.6300		0.7000		0.7700	31.5766 (78)	

Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains	421.0579	488.8279	537.2248	569.2918	581.2011	561.4473	541.6542	526.2480	510.1234	467.8863	419.5756	398.7260 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	54.6795	54.7949	54.9084	55.4483	55.5505	56.0311	56.0311	56.1211	55.8450	55.5505	55.3441	55.1301	
alpha	4.6453	4.6530	4.6606	4.6966	4.7034	4.7354	4.7354	4.7414	4.7230	4.7034	4.6896	4.6753	
util living area	0.9922	0.9837	0.9658	0.9228	0.8308	0.6677	0.5003	0.5340	0.7543	0.9328	0.9839	0.9939	(86)
MIT	19.8073	19.9951	20.2535	20.5573	20.8053	20.9496	20.9895	20.9857	20.9078	20.5940	20.1423	19.7704	(87)
Th 2	19.8644	19.8665	19.8686	19.8783	19.8801	19.8886	19.8886	19.8902	19.8853	19.8801	19.8764	19.8726	(88)
util rest of house	0.9896	0.9785	0.9546	0.8968	0.7750	0.5712	0.3794	0.4126	0.6665	0.9046	0.9778	0.9919	(89)
MIT 2	18.3088	18.5813	18.9520	19.3801	19.6976	19.8567	19.8850	19.8848	19.8185	19.4396	18.8037	18.2611	(90)
Living area fraction	19.0590	19.2892	19.6037	19.9695	20.2522	20.4039	20.4380	20.4360	20.3639	20.0176	19.4739	19.0168	(91)
MIT	19.0590	19.2892	19.6037	19.9695	20.2522	20.4039	20.4380	20.4360	20.3639	20.0176	19.4739	19.0168	(92)
Temperature adjustment	19.0590	19.2892	19.6037	19.9695	20.2522	20.4039	20.4380	20.4360	20.3639	20.0176	19.4739	19.0168	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	415.6802	476.6664	511.1353	511.9442	462.1514	346.8911	238.4663	249.2794	360.5454	425.1555	409.0734	394.6543	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	951.2783	925.4845	841.0610	703.5807	542.5804	365.0605	241.4091	253.4552	395.3068	597.4835	787.9684	947.1956	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	398.4850	301.6058	245.4647	137.9782	59.8391	0.0000	0.0000	0.0000	0.0000	128.2120	272.8044	411.0907	(98)
Space heating													1955.4800 (98)
Space heating per m2													(98) / (4) = 38.5316 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2091.4224 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	398.4850	301.6058	245.4647	137.9782	59.8391	0.0000	0.0000	0.0000	0.0000	128.2120	272.8044	411.0907	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	426.1871	322.5730	262.5291	147.5703	63.9991	0.0000	0.0000	0.0000	0.0000	137.1252	291.7694	439.6692	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7194	148.8965	156.8141	141.1836	138.7972	124.6555	120.3223	131.1982	130.7055	146.3694	154.0035	164.8659	(64)
Efficiency of water heater (217)m	87.0289	86.6595	86.0047	84.7527	82.7472	79.8000	79.8000	79.8000	79.8000	84.4629	86.3235	79.8000	(216)
Fuel for water heating, kWh/month	193.8659	171.8179	182.3321	166.5830	167.7364	156.2098	150.7798	164.4087	163.7914	173.2942	178.4027	189.1643	(219)
Water heating fuel used												2058.3862	(219)
Annual totals kWh/year													
Space heating fuel - main system												2091.4224	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.1711	(232)
Total delivered energy for all uses												4467.9798	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2091.4224	0.2160	451.7472 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2058.3862	0.2160	444.6114 (264)
Space and water heating			896.3587 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.1711	0.5190	126.2058 (268)
Total CO2, kg/m2/year			1061.4895 (272)
Emissions per m2 for space and water heating			17.6622 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4868 (272b)
Emissions per m2 for pumps and fans			0.7670 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.6622 * 1.00) + 2.4868 + 0.7670, rounded to 2 d.p.			20.9200 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	110	Issued on Date	29/04/2022
Assessment Reference	110	Prop Type Ref	
Property			
SAP Rating	83 B	DER	17.13
Environmental	87 B	TER	18.73
CO ₂ Emissions (t/year)	1.04	% DER<TER	8.54
General Requirements Compliance	Pass	DFEE	45.80
		TFEE	53.66
		% DFEE<TFEE	14.65
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Ground-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.73 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.13 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)53.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)45.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading: Average
Windows facing South East: 6.24 m², No overhang
Windows facing South: 2.21 m², No overhang
Windows facing South West: 3.92 m², No overhang
Windows facing West: 1.37 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Floor U-value 0.10 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.4200 (1b)	x 2.8000 (2b)	= 205.5760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 205.5760 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							2	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1275 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			13.7400	1.1450	15.7328		(27)					
Ground Floor			73.4200	0.1000	7.3420		(28a)					
External Wall	59.0000	13.7400	45.2600	0.1500	6.7890		(29a)					
Corridor	7.6200	1.8900	5.7300	0.2500	1.4325		(29a)					
Unheated	17.1100		17.1100	0.2000	3.4220		(29a)					
Total net area of external elements Aum(A, m2)			157.1500				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		36.6083		(33)					
Party Wall 1			20.5200	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.4738 (36)					
Total fabric heat loss							(33) + (36) = 49.0821 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 18.9995	Feb 18.7832	Mar 18.5670	Apr 17.4858	May 17.2695	Jun 16.1883	Jul 16.1883	Aug 15.9721	Sep 16.6208	Oct 17.2695	Nov 17.7020	Dec 18.1345 (38)
Heat transfer coeff	68.0816	67.8653	67.6491	66.5679	66.3517	65.2705	65.2705	65.0542	65.7029	66.3517	66.7841	67.2166 (39)
Average = Sum(39)m / 12 =	66.5138 (39)											
HLP	Jan 0.9273	Feb 0.9243	Mar 0.9214	Apr 0.9067	May 0.9037	Jun 0.8890	Jul 0.8890	Aug 0.8861	Sep 0.8949	Oct 0.9037	Nov 0.9096	Dec 0.9155 (40)
HLP (average)	0.9059 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3262 (42)
Average daily hot water use (litres/day)												89.4475 (43)
Daily hot water use	Jan 98.3923	Feb 94.8144	Mar 91.2365	Apr 87.6586	May 84.0807	Jun 80.5028	Jul 80.5028	Aug 84.0807	Sep 87.6586	Oct 91.2365	Nov 94.8144	Dec 98.3923 (44)
Energy conte	145.9129	127.6164	131.6887	114.8094	110.1623	95.0617	88.0886	101.0830	102.2903	119.2094	130.1264	141.3089 (45)
Energy content (annual)												Total = Sum(45)m = 1407.3579 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	21.8869	19.1425	19.7533	17.2214	16.5243	14.2593	13.2133	15.1625	15.3435	17.8814	19.5190	21.1963 (46)
Water storage loss:												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
201.1897	177.5438	186.9655	168.3030	165.4391	148.5554	143.3654	156.3598	155.7839	174.4862	183.6201	196.5857	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
201.1897	177.5438	186.9655	168.3030	165.4391	148.5554	143.3654	156.3598	155.7839	174.4862	183.6201	196.5857	(64)
Heat gains from water heating, kWh/month												
92.7375	82.3744	88.0079	80.9691	80.8504	74.4030	73.5109	77.8315	76.8065	83.8586	86.0620	91.2066	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	116.3106	116.3106	116.3106	116.3106	116.3106	116.3106	116.3106	116.3106	116.3106	116.3106	116.3106	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
18.3178	16.2697	13.2314	10.0170	7.4878	6.3215	6.8307	8.8787	11.9170	15.1314	17.6606	18.8269	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
205.1440	207.2728	201.9084	190.4882	176.0723	162.5234	153.4719	151.3432	156.7076	168.1277	182.5436	196.0925	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.6311	34.6311	34.6311	34.6311	34.6311	34.6311	34.6311	34.6311	34.6311	34.6311	34.6311	34.6311	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-93.0485	-93.0485	-93.0485	-93.0485	-93.0485	-93.0485	-93.0485	-93.0485	-93.0485	-93.0485	-93.0485	-93.0485	(71)
Water heating gains (Table 5)												
124.6472	122.5809	118.2902	112.4570	108.6699	103.3374	98.8050	104.6123	106.6756	112.7131	119.5305	122.5896	(72)
Total internal gains												
406.0021	404.0165	391.3231	370.8554	350.1232	330.0756	317.0008	322.7274	333.1934	353.8654	377.6279	395.4021	(73)

6. Solar gains

[Jan]					Area	Solar flux	g	FF			Access	Gains
					m2	Table 6a	Specific data	Specific data			factor	W
						W/m2	or Table 6b	or Table 6c			Table 6d	
Southeast					6.2400	36.7938	0.4000	0.8000			0.7700	50.9147 (77)
South					2.2100	46.7521	0.4000	0.8000			0.7700	22.9127 (78)
Southwest					3.9200	36.7938	0.4000	0.8000			0.7700	31.9848 (79)
West					1.3700	19.6403	0.4000	0.8000			0.7700	5.9669 (80)

Solar gains	111.7791	190.4062	260.2311	321.4541	358.7968	355.5525	343.0680	315.3716	281.4934	210.3904	133.8939	95.6503 (83)
Total gains	517.7812	594.4228	651.5542	692.3096	708.9201	685.6281	660.0688	638.0989	614.6868	564.2558	511.5218	491.0524 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.8897	75.1283	75.3685	76.5926	76.8422	78.1151	78.1151	78.3748	77.6010	76.8422	76.3446	75.8534
alpha	5.9926	6.0086	6.0246	6.1062	6.1228	6.2077	6.2077	6.2250	6.1734	6.1228	6.0896	6.0569
util living area	0.9951	0.9881	0.9697	0.9154	0.7936	0.5980	0.4337	0.4667	0.7042	0.9302	0.9879	0.9963 (86)
MIT	20.1711	20.3259	20.5341	20.7702	20.9271	20.9896	20.9988	20.9981	20.9725	20.7788	20.4342	20.1448 (87)
Th 2	20.1444	20.1469	20.1493	20.1618	20.1643	20.1769	20.1769	20.1794	20.1718	20.1643	20.1593	20.1543 (88)
util rest of house	0.9936	0.9845	0.9606	0.8911	0.7434	0.5260	0.3533	0.3847	0.6325	0.9048	0.9836	0.9952 (89)
MIT 2	19.0425	19.2685	19.5678	19.9015	20.0964	20.1702	20.1764	20.1786	20.1519	19.9209	19.4363	19.0120 (90)
Living area fraction									fLA = Living area / (4) =			0.3909 (91)
MIT	19.4837	19.6819	19.9455	20.2411	20.4211	20.4905	20.4979	20.4989	20.4727	20.2563	19.8264	19.4548 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4837	19.6819	19.9455	20.2411	20.4211	20.4905	20.4979	20.4989	20.4727	20.2563	19.8264	19.4548 (93)

8. Space heating requirement

Utilisation	0.9920	0.9820	0.9580	0.8936	0.7597	0.5539	0.3848	0.4168	0.6595	0.9080	0.9814	0.9939 (94)
Useful gains	513.6464	583.7131	624.1571	618.6699	538.5392	379.7458	253.9937	265.9718	405.3791	512.3221	502.0136	488.0757 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1033.7291	1003.1764	909.5755	754.9517	578.6610	384.4756	254.4147	266.6523	418.7032	640.7092	849.9196	1025.3769 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	386.9415	281.8793	212.3513	98.1229	29.8506	0.0000	0.0000	0.0000	0.0000	95.5200	250.4923	399.7521 (98)
Space heating												1754.9101 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating per m2

(98) / (4) = 23.9023 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1754.9101 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1842.6556 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2058.1977 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2161.1076 (310a)
Electricity used for heat distribution	40.0376 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	197.5071 (330a)
Total electricity for the above, kWh/year	197.5071 (331)
Electricity for lighting (calculated in Appendix L)	323.4974 (332)
Total delivered energy for all uses	4524.7677 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	4473.4784	0.2160	966.2713 (367)
Electrical energy for heat distribution	40.0376	0.5190	20.7795 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			987.0509 (373)
Space and water heating			987.0509 (376)
Pumps and fans	197.5071	0.5190	102.5062 (378)
Energy for lighting	323.4974	0.5190	167.8951 (379)
Total CO2, kg/year			1257.4522 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			17.1300 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER	17.1300 ZC1
Total Floor Area	73.4200
Assumed number of occupants	N 2.3262
CO2 emission factor in Table 12 for electricity displaced from grid	EF 0.5190
CO2 emissions from appliances, equation (L14)	16.5573 ZC2
CO2 emissions from cooking, equation (L16)	2.3812 ZC3
Total CO2 emissions	36.0686 ZC4
Residual CO2 emissions offset from biofuel CHP	0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year	0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000 ZC7
Net CO2 emissions	36.0686 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.4200 (1b)	x 2.8000 (2b)	= 205.5760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 205.5760 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1459 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3959 (18)
Number of sides sheltered					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3365 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.4291	0.4207	0.4123	0.3702	0.3618	0.3197	0.3197	0.3113	0.3365	0.3618	0.3786	0.3954 (22b)
Effective ac	0.5921	0.5885	0.5850	0.5685	0.5654	0.5511	0.5511	0.5485	0.5566	0.5654	0.5717	0.5782 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			13.7400	1.3258	18.2159		(27)
Ground Floor			73.4200	0.1300	9.5446		(28a)
External Wall	59.0000	13.7400	45.2600	0.1800	8.1468		(29a)
Corridor	7.6200	1.8900	5.7300	0.1800	1.0314		(29a)
Unheated	17.1100		17.1100	0.1800	3.0798		(29a)
Total net area of external elements Aum(A, m ²)			157.1500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 41.9085		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.5544 (36)
Total fabric heat loss						(33) + (36) = 52.4629	(37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	40.1654	39.9228	39.6851	38.5686	38.3597	37.3873	37.3873
Heat transfer coeff	92.6283	92.3858	92.1480	91.0315	90.8226	89.8502	89.8502
Average = Sum(39)m / 12 =							
	92.6283	92.3858	92.1480	91.0315	90.8226	89.8502	89.8502
HLP	1.2616	1.2583	1.2551	1.2399	1.2370	1.2238	1.2238
HLP (average)							
Days in month	31	28	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3262 (42)
Average daily hot water use (litres/day)												89.4475 (43)
Daily hot water use	98.3923	94.8144	91.2365	87.6586	84.0807	80.5028	80.5028	84.0807	87.6586	91.2365	94.8144	98.3923 (44)
Energy conte	145.9129	127.6164	131.6887	114.8094	110.1623	95.0617	88.0886	101.0830	102.2903	119.2094	130.1264	141.3089 (45)
Energy content (annual)										Total = Sum(45)m =		1407.3579 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.8869	19.1425	19.7533	17.2214	16.5243	14.2593	13.2133	15.1625	15.3435	17.8814	19.5190	21.1963 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (58)
Total heat required for water heating calculated for each month	192.5078	169.7021	178.2836	159.9012	156.7572	140.1535	134.6835	147.6779	147.3821	165.8043	175.2183	187.9038 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) =	Sum (63)m =		0.0000	0.0000 (63)
Output from w/h	192.5078	169.7021	178.2836	159.9012	156.7572	140.1535	134.6835	147.6779	147.3821	165.8043	175.2183	187.9038 (64)
								Total per year (kWh/year) =	Sum (64)m =		1955.9753	1955.9753 (64)
Heat gains from water heating, kWh/month	85.7920	76.1010	81.0624	74.2476	73.9049	67.6815	66.5654	70.8860	70.0850	76.9131	79.3405	84.2611 (65)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Not applicable

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3077.6898 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	592.8107	445.8871	357.8252	193.9761	79.5613	0.0000	0.0000	0.0000	0.0000	190.3915	407.1038	610.0841	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	634.0221	476.8846	382.7008	207.4611	85.0923	0.0000	0.0000	0.0000	0.0000	203.6273	435.4052	652.4963	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	192.5078	169.7021	178.2836	159.9012	156.7572	140.1535	134.6835	147.6779	147.3821	165.8043	175.2183	187.9038	(64)
Efficiency of water heater (217)m	87.6200	87.2740	86.6368	85.3301	83.1081	79.8000	79.8000	79.8000	79.8000	85.1833	86.9903	87.7301	(217)
Fuel for water heating, kWh/month	219.7075	194.4474	205.7826	187.3913	188.6184	175.6310	168.7764	185.0600	184.6893	194.6442	201.4227	214.1840	(219)
Water heating fuel used												2320.3549	(219)
Annual totals kWh/year													
Space heating fuel - main system												3077.6898	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												327.9494	(232)
Total delivered energy for all uses												5800.9941	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3077.6898	0.2160	664.7810 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2320.3549	0.2160	501.1967 (264)
Space and water heating			1165.9776 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	327.9494	0.5190	170.2057 (268)
Total CO2, kg/m2/year			1375.1084 (272)
Emissions per m2 for space and water heating			15.8809 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3182 (272b)
Emissions per m2 for pumps and fans			0.5302 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.8809 * 1.00) + 2.3182 + 0.5302, rounded to 2 d.p.			18.7300 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	111	Issued on Date	29/04/2022
Assessment Reference	111	Prop Type Ref	
Property			
SAP Rating	83 B	DER	18.57
Environmental	86 B	TER	19.91
CO ₂ Emissions (t/year)	1.10	% DER<TER	6.75
General Requirements Compliance	Pass	DFEE	50.82
		TFEE	59.45
		% DFEE<TFEE	14.51
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 19.91 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 18.57 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)59.4 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)50.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.61	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing West:	5.88 m ² , No overhang
Windows facing North West:	7.07 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Exposed floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							2	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1275 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			12.9500	1.1450	14.8282		(27)					
Exposed Floor			72.7700	0.1000	7.2770		(28b)					
External Wall	35.0800	12.9500	22.1300	0.1500	3.3195		(29a)					
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)					
Core	18.2300		18.2300	0.2500	4.5575		(29a)					
Total net area of external elements Aum(A, m2)			143.5800				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		35.7747		(33)					
Party Wall 1			18.3000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								16.4236 (36)				
Total fabric heat loss						(33) + (36) =	52.1983 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 17.0688	Feb 16.8774	Mar 16.6860	Apr 15.7292	May 15.5379	Jun 14.5811	Jul 14.5811	Aug 14.3897	Sep 14.9638	Oct 15.5379	Nov 15.9206	Dec 16.3033 (38)
Heat transfer coeff	69.2671	69.0758	68.8844	67.9276	67.7362	66.7794	66.7794	66.5880	67.1621	67.7362	68.1189	68.5017 (39)
Average = Sum(39)m / 12 =												67.8797 (39)
HLP	Jan 0.9519	Feb 0.9492	Mar 0.9466	Apr 0.9335	May 0.9308	Jun 0.9177	Jul 0.9177	Aug 0.9150	Sep 0.9229	Oct 0.9308	Nov 0.9361	Dec 0.9413 (40)
HLP (average)												0.9328 (40)
Days in month												
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	Jan 98.0067	Feb 94.4428	Mar 90.8789	Apr 87.3151	May 83.7512	Jun 80.1873	Jul 80.1873	Aug 83.7512	Sep 87.3151	Oct 90.8789	Nov 94.4428	Dec 98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)												Total = Sum(45)m = 1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)
Water storage loss:												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(64)
Heat gains from water heating, kWh/month												
92.5474	82.2081	87.8363	80.8195	80.7069	74.2791	73.3961	77.6998	76.6732	83.7032	85.8924	91.0225	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
18.2553	16.2142	13.1863	9.9829	7.4623	6.3000	6.8074	8.8485	11.8764	15.0798	17.6004	18.7627	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	(71)
Water heating gains (Table 5)												
124.3916	122.3335	118.0596	112.2492	108.4770	103.1654	98.6507	104.4353	106.4905	112.5044	119.2950	122.3421	(72)
Total internal gains												
403.9925	402.0068	389.3790	369.0270	348.4216	328.4959	315.5019	321.2141	331.6232	352.1788	375.8026	393.4637	(73)

6. Solar gains

[Jan]			Area	Solar flux	g		FF	Access		Gains		
			m2	Table 6a	Specific data		Specific data	factor		W		
				W/m2	or Table 6b		or Table 6c	Table 6d				
West			5.8800	19.6403	0.4000		0.8000	0.7700		25.6099 (80)		
Northwest			7.0700	11.2829	0.4000		0.8000	0.7700		17.6899 (81)		
Solar gains	43.2998	86.1067	147.3804	226.8726	290.6833	303.6424	286.5514	237.3201	175.0084	103.4509	54.1910	35.5068 (83)
Total gains	447.2923	488.1134	536.7594	595.8996	639.1049	632.1383	602.0533	558.5342	506.6316	455.6297	429.9935	428.9705 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	72.9563	73.1584	73.3616	74.3950	74.6052	75.6741	75.6741	75.8916	75.2429	74.6052	74.1860	73.7715
alpha	5.8638	5.8772	5.8908	5.9597	5.9737	6.0449	6.0449	6.0594	6.0162	5.9737	5.9457	5.9181
util living area	0.9977	0.9955	0.9879	0.9547	0.8503	0.6542	0.4848	0.5418	0.8166	0.9725	0.9950	0.9982 (86)
MIT	20.0487	20.1612	20.3720	20.6601	20.8837	20.9813	20.9973	20.9950	20.9331	20.6487	20.3030	20.0305 (87)
Th 2	20.1236	20.1259	20.1281	20.1392	20.1414	20.1525	20.1525	20.1547	20.1480	20.1414	20.1369	20.1325 (88)
util rest of house	0.9969	0.9941	0.9837	0.9390	0.8049	0.5767	0.3932	0.4457	0.7484	0.9599	0.9930	0.9976 (89)
MIT 2	18.8487	19.0144	19.3218	19.7379	20.0284	20.1402	20.1515	20.1526	20.0947	19.7301	19.2301	18.8288 (90)
Living area fraction									fLA = Living area / (4) =			0.3848 (91)
MIT	19.3104	19.4556	19.7259	20.0927	20.3575	20.4638	20.4769	20.4768	20.4173	20.0835	19.6429	19.2912 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3104	19.4556	19.7259	20.0927	20.3575	20.4638	20.4769	20.4768	20.4173	20.0835	19.6429	19.2912 (93)

8. Space heating requirement

Utilisation	0.9959	0.9926	0.9813	0.9380	0.8173	0.6060	0.4285	0.4829	0.7717	0.9589	0.9916	0.9968 (94)
Useful gains	445.4743	484.4954	526.7263	558.9567	522.3341	383.0500	257.9990	269.6909	390.9618	436.9042	426.3607	427.5904 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
1039.7279	1005.4410	911.0591	760.2949	586.4273	391.5827	258.8998	271.4637	424.2822	642.3778	854.4101	1033.7730	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
442.1247	350.0755	285.9436	144.9635	47.6853	0.0000	0.0000	0.0000	0.0000	152.8723	308.1955	450.9998	(98)
Space heating												2182.8603 (98)
Space heating per m2												(98) / (4) = 29.9967 (99)

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	2182.8603	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	2292.0033	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating:		
Annual water heating requirement	2052.6825	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2155.3166	(310a)
Electricity used for heat distribution	44.4732	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)		
mechanical ventilation fans (SFP = 0.7625)	169.2357	(330a)
Total electricity for the above, kWh/year	169.2357	(331)
Electricity for lighting (calculated in Appendix L)	322.3944	(332)
Total delivered energy for all uses	4938.9500	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	4969.0725	0.2160	1073.3197 (367)
Electrical energy for heat distribution	44.4732	0.5190	23.0816 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1096.4013 (373)
Space and water heating			1096.4013 (376)
Pumps and fans	169.2357	0.5190	87.8333 (378)
Energy for lighting	322.3944	0.5190	167.3227 (379)
Total CO2, kg/year			1351.5573 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			18.5700 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		18.5700	ZC1
Total Floor Area	TFA	72.7700	
Assumed number of occupants	N	2.3115	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.5855	ZC2
CO2 emissions from cooking, equation (L16)		2.3976	ZC3
Total CO2 emissions		37.5531	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		37.5531	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1649 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4149 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3527 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4497	0.4408	0.4320	0.3879	0.3791	0.3350	0.3350	0.3262	0.3527	0.3791	0.3968	0.4144 (22b)
Effective ac	0.6011	0.5972	0.5933	0.5752	0.5719	0.5561	0.5561	0.5532	0.5622	0.5719	0.5787	0.5859 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			12.9500	1.3258	17.1686			(27)					
Exposed Floor			72.7700	0.1300	9.4601			(28b)					
External Wall	35.0800	12.9500	22.1300	0.1800	3.9834			(29a)					
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098			(29a)					
Core	18.2300		18.2300	0.1800	3.2814			(29a)					
Total net area of external elements Aum(A, m2)			143.5800					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.5933			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								15.1820 (36)					
Total fabric heat loss						(33) + (36) =		53.7753 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 36.0868	Feb 35.8511	Mar 35.6201	Apr 34.5351	May 34.3321	Jun 33.3870	Jul 33.3870	Aug 33.2120	Sep 33.7511	Oct 34.3321	Nov 34.7427	Dec 35.1721	(38)
Heat transfer coeff	89.8620	89.6264	89.3954	88.3103	88.1073	87.1623	87.1623	86.9873	87.5263	88.1073	88.5180	88.9473	(39)
Average = Sum(39)m / 12 =												88.3094	(39)
HLP	Jan 1.2349	Feb 1.2316	Mar 1.2285	Apr 1.2136	May 1.2108	Jun 1.1978	Jul 1.1978	Aug 1.1954	Sep 1.2028	Oct 1.2108	Nov 1.2164	Dec 1.2223	(40)
HLP (average)												1.2135	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)										Total = Sum(45)m =		1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												
21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)	
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

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Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (64)
Heat gains from water heating, kWh/month	85.6018	75.9347	80.8908	74.0980	73.7613	67.5576	66.4506	70.7543	69.9517	76.7577	79.1709	84.0770 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5798	16.5024	13.4206	10.1603	7.5949	6.4120	6.9283	9.0057	12.0875	15.3478	17.9132	19.0961	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	(71)
Water heating gains (Table 5)	115.0562	112.9981	108.7242	102.9139	99.1416	93.8300	89.3153	95.0999	97.1551	103.1690	109.9597	113.0067	(72)
Total internal gains	397.9816	395.9596	383.2780	362.8690	342.2188	322.2725	309.2875	315.0360	325.4989	346.1114	369.7800	387.4618	(73)

6. Solar gains

[Jan]				Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W	
West				5.8800	19.6403	0.6300	0.7000	0.7700			35.2936 (80)	
Northwest				7.0700	11.2829	0.6300	0.7000	0.7700			24.3789 (81)	
Solar gains	59.6725	118.6657	203.1086	312.6588	400.5979	418.4572	394.9036	327.0568	241.1834	142.5683	74.6819	48.9328 (83)
Total gains	457.6541	514.6253	586.3866	675.5278	742.8167	740.7297	704.1911	642.0927	566.6823	488.6797	444.4619	436.3946 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	56.2359	56.3838	56.5295	57.2240	57.3559	57.9777	57.9777	58.0944	57.7366	57.3559	57.0898	56.8142
alpha	4.7491	4.7589	4.7686	4.8149	4.8237	4.8652	4.8652	4.8730	4.8491	4.8237	4.8060	4.7876
util living area	0.9975	0.9952	0.9874	0.9565	0.8662	0.6954	0.5313	0.5982	0.8543	0.9769	0.9952	0.9980 (86)
MIT	19.6729	19.8163	20.0874	20.4611	20.7754	20.9453	20.9880	20.9795	20.8468	20.4397	19.9951	19.6513 (87)
Th 2	19.8922	19.8948	19.8973	19.9092	19.9114	19.9218	19.9218	19.9237	19.9178	19.9114	19.9069	19.9022 (88)
util rest of house	0.9967	0.9936	0.9828	0.9399	0.8172	0.6006	0.4079	0.4705	0.7819	0.9651	0.9932	0.9974 (89)
MIT 2	18.1331	18.3440	18.7393	19.2789	19.6937	19.8862	19.9175	19.9154	19.7940	19.2593	18.6141	18.1085 (90)
Living area fraction	18.7256	18.9105	19.2580	19.7338	20.1099	20.2937	20.3294	20.3248	20.1991	fLA = Living area / (4) =		0.3848 (91)
MIT	18.7256	18.9105	19.2580	19.7338	20.1099	20.2937	20.3294	20.3248	20.1991	19.7135	19.1455	18.7021 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7256	18.9105	19.2580	19.7338	20.1099	20.2937	20.3294	20.3248	20.1991	19.7135	19.1455	18.7021 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	455.5401	510.2457	574.1847	632.7059	614.5011	470.4759	320.9503	333.8631	455.2550	470.2260	440.5719	434.7806	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1296.3112	1255.7099	1140.5072	956.7349	740.9735	496.2745	325.0657	341.4106	533.8312	802.9668	1066.2411	1289.9263	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	625.5337	500.9519	421.3439	233.3009	94.0954	0.0000	0.0000	0.0000	0.0000	247.5592	450.4818	636.2283	(98)
Space heating												3209.4952	(98)
Space heating per m ²												44.1046	(99)

8c. Space cooling requirement

Not applicable

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9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3432.6152 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	625.5337	500.9519	421.3439	233.3009	94.0954	0.0000	0.0000	0.0000	0.0000	247.5592	450.4818	636.2283	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	669.0200	535.7774	450.6352	249.5196	100.6368	0.0000	0.0000	0.0000	0.0000	264.7692	481.7987	680.4581	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500	(64)
Efficiency of water heater (217)m	87.7378	87.5365	87.0372	85.8278	83.5100	79.8000	79.8000	79.8000	79.8000	85.8885	87.2314	87.8213	(216)
Fuel for water heating, kWh/month	218.7609	193.2930	204.2432	185.7804	187.1938	175.1642	168.3438	184.5636	184.1870	192.5022	200.2813	213.3310	(219)
Water heating fuel used												2307.6443	(219)
Annual totals kWh/year													
Space heating fuel - main system												3432.6152	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												328.1242	(232)
Total delivered energy for all uses												6143.3838	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3432.6152	0.2160	741.4449 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2307.6443	0.2160	498.4512 (264)
Space and water heating			1239.8961 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	328.1242	0.5190	170.2965 (268)
Total CO2, kg/m2/year			1449.1175 (272)
Emissions per m2 for space and water heating			17.0386 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3402 (272b)
Emissions per m2 for pumps and fans			0.5349 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.0386 * 1.00) + 2.3402 + 0.5349, rounded to 2 d.p.			19.9100 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	112	Issued on Date	29/04/2022
Assessment Reference	112	Prop Type Ref	
Property			
SAP Rating	83 B	DER	18.96
Environmental	86 B	TER	20.39
CO ₂ Emissions (t/year)	1.12	% DER<TER	6.99
General Requirements Compliance	Pass	DFEE	52.36
		TFEE	61.67
		% DFEE<TFEE	15.09
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 20.39 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 18.96 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)61.7 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)52.4 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.61	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing North:	5.88 m ² , No overhang
Windows facing North West:	7.07 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Exposed floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							2	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1275 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			12.9500	1.1450	14.8282		(27)					
Exposed Floor			72.7700	0.1000	7.2770		(28b)					
External Wall	35.0800	12.9500	22.1300	0.1500	3.3195		(29a)					
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)					
Core	18.2300		18.2300	0.2500	4.5575		(29a)					
Total net area of external elements Aum(A, m2)			143.5800				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		35.7747		(33)					
Party Wall 1			18.3000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								16.4236 (36)				
Total fabric heat loss						(33) + (36) =	52.1983 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 17.0688	Feb 16.8774	Mar 16.6860	Apr 15.7292	May 15.5379	Jun 14.5811	Jul 14.5811	Aug 14.3897	Sep 14.9638	Oct 15.5379	Nov 15.9206	Dec 16.3033 (38)
Heat transfer coeff	69.2671	69.0758	68.8844	67.9276	67.7362	66.7794	66.7794	66.5880	67.1621	67.7362	68.1189	68.5017 (39)
Average = Sum(39)m / 12 =												67.8797 (39)
HLP	Jan 0.9519	Feb 0.9492	Mar 0.9466	Apr 0.9335	May 0.9308	Jun 0.9177	Jul 0.9177	Aug 0.9150	Sep 0.9229	Oct 0.9308	Nov 0.9361	Dec 0.9413 (40)
HLP (average)												0.9328 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	Jan 98.0067	Feb 94.4428	Mar 90.8789	Apr 87.3151	May 83.7512	Jun 80.1873	Jul 80.1873	Aug 83.7512	Sep 87.3151	Oct 90.8789	Nov 94.4428	Dec 98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)												Total = Sum(45)m = 1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												

	21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)
Water storage loss:												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage												
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
Solar input	200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319 (62)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h								Solar input (sum of months) =	Sum(63)m =			0.0000 (63)
	200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319 (64)
								Total per year (kWh/year) =	Sum(64)m =			2052.6825 (64)
Heat gains from water heating, kWh/month												
	92.5474	82.2081	87.8363	80.8195	80.7069	74.2791	73.3961	77.6998	76.6732	83.7032	85.8924	91.0225 (66)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9964	0.9941	0.9864	0.9548	0.8530	0.6475	0.4633	0.5243	0.8140	0.9681	0.9928	0.9971 (94)
Useful gains	433.9934	461.7903	492.5012	523.1235	502.4792	379.1243	257.4647	268.5978	378.3411	414.0994	412.1952	418.2621 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1038.3392	1002.7049	906.9277	756.0255	584.1804	391.1664	258.8352	271.3408	422.8984	639.6613	852.7179	1032.6538 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	449.6333	363.4946	308.3333	167.6895	60.7856	0.0000	0.0000	0.0000	0.0000	167.8180	317.1764	457.1074 (98)
Space heating												2292.0382 (98)
Space heating per m2												31.4970 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	2292.0382	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	2406.6401	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating:		
Annual water heating requirement	2052.6825	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2155.3166	(310a)
Electricity used for heat distribution	45.6196	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)		
mechanical ventilation fans (SFP = 0.7625)	169.2357	(330a)
Total electricity for the above, kWh/year	169.2357	(331)
Electricity for lighting (calculated in Appendix L)	322.3944	(332)
Total delivered energy for all uses	5053.5868	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	5097.1583	0.2160	1100.9862 (367)
Electrical energy for heat distribution	45.6196	0.5190	23.6766 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1124.6627 (373)
Space and water heating			1124.6627 (376)
Pumps and fans	169.2357	0.5190	87.8333 (378)
Energy for lighting	322.3944	0.5190	167.3227 (379)
Total CO2, kg/year			1379.8188 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			18.9600 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		18.9600	ZC1
Total Floor Area	TFA	72.7700	
Assumed number of occupants	N	2.3115	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.5855	ZC2
CO2 emissions from cooking, equation (L16)		2.3976	ZC3
Total CO2 emissions		37.9431	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		37.9431	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1649 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4149 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3527 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4497	0.4408	0.4320	0.3879	0.3791	0.3350	0.3350	0.3262	0.3527	0.3791	0.3968	0.4144 (22b)
Effective ac	0.6011	0.5972	0.5933	0.5752	0.5719	0.5561	0.5561	0.5532	0.5622	0.5719	0.5787	0.5859 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			12.9500	1.3258	17.1686			(27)					
Exposed Floor			72.7700	0.1300	9.4601			(28b)					
External Wall	35.0800	12.9500	22.1300	0.1800	3.9834			(29a)					
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098			(29a)					
Core	18.2300		18.2300	0.1800	3.2814			(29a)					
Total net area of external elements Aum(A, m2)			143.5800					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.5933			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								15.1820 (36)					
Total fabric heat loss						(33) + (36) =		53.7753 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 36.0868	Feb 35.8511	Mar 35.6201	Apr 34.5351	May 34.3321	Jun 33.3870	Jul 33.3870	Aug 33.2120	Sep 33.7511	Oct 34.3321	Nov 34.7427	Dec 35.1721	(38)
Heat transfer coeff	89.8620	89.6264	89.3954	88.3103	88.1073	87.1623	87.1623	86.9873	87.5263	88.1073	88.5180	88.9473	(39)
Average = Sum(39)m / 12 =												88.3094	(39)
HLP	Jan 1.2349	Feb 1.2316	Mar 1.2285	Apr 1.2136	May 1.2108	Jun 1.1978	Jul 1.1978	Aug 1.1954	Sep 1.2028	Oct 1.2108	Nov 1.2164	Dec 1.2223	(40)
HLP (average)												1.2135	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)										Total = Sum(45)m =		1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												
21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)	
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (64)
Heat gains from water heating, kWh/month	85.6018	75.9347	80.8908	74.0980	73.7613	67.5576	66.4506	70.7543	69.9517	76.7577	79.1709	84.0770 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5798	16.5024	13.4206	10.1603	7.5949	6.4120	6.9283	9.0057	12.0875	15.3478	17.9132	19.0961	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	(71)
Water heating gains (Table 5)	115.0562	112.9981	108.7242	102.9139	99.1416	93.8300	89.3153	95.0999	97.1551	103.1690	109.9597	113.0067	(72)
Total internal gains	397.9816	395.9596	383.2780	362.8690	342.2188	322.2725	309.2875	315.0360	325.4989	346.1114	369.7800	387.4618	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
North					5.8800	10.6334	0.6300	0.7000			0.7700	19.1083 (74)
Northwest					7.0700	11.2829	0.6300	0.7000			0.7700	24.3789 (81)
Solar gains	43.4871	86.1407	151.4575	246.5010	331.6343	354.1512	331.0351	263.3898	183.5487	104.1129	54.2474	35.8386 (83)
Total gains	441.4687	482.1003	534.7355	609.3700	673.8531	676.4237	640.3226	578.4258	509.0476	450.2243	424.0274	423.3004 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	56.2359	56.3838	56.5295	57.2240	57.3559	57.9777	57.9777	58.0944	57.7366	57.3559	57.0898	56.8142
alpha	4.7491	4.7589	4.7686	4.8149	4.8237	4.8652	4.8652	4.8730	4.8491	4.8237	4.8060	4.7876
util living area	0.9979	0.9964	0.9913	0.9701	0.8983	0.7411	0.5781	0.6518	0.8915	0.9832	0.9961	0.9983 (86)
MIT	19.6526	19.7758	20.0252	20.3909	20.7267	20.9277	20.9829	20.9704	20.8081	20.3954	19.9696	19.6348 (87)
Th 2	19.8922	19.8948	19.8973	19.9092	19.9114	19.9218	19.9218	19.9237	19.9178	19.9114	19.9069	19.9022 (88)
util rest of house	0.9972	0.9951	0.9881	0.9579	0.8563	0.6471	0.4469	0.5184	0.8292	0.9743	0.9944	0.9977 (89)
MIT 2	18.1034	18.2852	18.6500	19.1831	19.6376	19.8728	19.9155	19.9112	19.7547	19.1977	18.5772	18.0844 (90)
Living area fraction									fLA = Living area / (4) =			0.3846 (91)
MIT	18.6993	18.8585	19.1789	19.6477	20.0565	20.2786	20.3260	20.3186	20.1598	19.6584	19.1128	18.6807 (92)
Temperature adjustment												0.000
adjusted MIT	18.6993	18.8585	19.1789	19.6477	20.0565	20.2786	20.3260	20.3186	20.1598	19.6584	19.1128	18.6807 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	439.7040	478.9183	526.7761	581.4154	581.4024	460.3668	318.7715	329.7272	430.4523	437.3646	420.9400	421.9182	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1293.9509	1251.0536	1133.4361	949.1326	736.2711	494.9563	324.7702	340.8669	530.3960	798.1075	1063.3453	1288.0228	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	635.5597	518.8749	451.3551	264.7564	115.2223	0.0000	0.0000	0.0000	0.0000	268.3927	462.5318	644.3818	(98)
Space heating												3361.0748	(98)
Space heating per m ²										(98) / (4) =		46.1876	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3594.7324 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	635.5597	518.8749	451.3551	264.7564	115.2223	0.0000	0.0000	0.0000	0.0000	268.3927	462.5318	644.3818	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	679.7430	554.9464	482.7327	283.1620	123.2324	0.0000	0.0000	0.0000	0.0000	287.0511	494.6864	689.1784	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500	(64)
Efficiency of water heater (217)m	87.7703	87.6113	87.1963	86.1577	84.0148	79.8000	79.8000	79.8000	79.8000	86.0992	87.2911	87.8468	(216)
Fuel for water heating, kWh/month	218.6800	193.1281	203.8704	185.0692	186.0689	175.1642	168.3438	184.5636	184.1870	192.0310	200.1446	213.2691	(219)
Water heating fuel used												2304.5198	(219)
Annual totals kWh/year													
Space heating fuel - main system												3594.7324	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												328.1242	(232)
Total delivered energy for all uses												6302.3765	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3594.7324	0.2160	776.4622 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2304.5198	0.2160	497.7763 (264)
Space and water heating			1274.2385 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	328.1242	0.5190	170.2965 (268)
Total CO2, kg/m2/year			1483.4600 (272)
Emissions per m2 for space and water heating			17.5105 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3402 (272b)
Emissions per m2 for pumps and fans			0.5349 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.5105 * 1.00) + 2.3402 + 0.5349, rounded to 2 d.p.			20.3900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	113	Issued on Date	29/04/2022
Assessment Reference	113	Prop Type Ref	
Property			
SAP Rating	85 B	DER	14.54
Environmental	89 B	TER	16.13
CO ₂ Emissions (t/year)	0.90	% DER<TER	9.85
General Requirements Compliance	Fail	DFEE	34.89
		TFEE	40.93
		% DFEE<TFEE	14.77
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 74 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Mains gas (c)
Fuel factor: 1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.13 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.54 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 40.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 34.9 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room stats OK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing North: 1.97 m², No overhang
Windows facing North East: 6.47 m², No overhang
Windows facing East: 2.21 m², No overhang
Windows facing South East: 6.24 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Exposed floor U-value 0.10 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												75.6500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			1.8900	1.0000	1.8900		(26)	
Window (Uw = 1.20)			16.8900	1.1450	19.3397		(27)	
Exposed Floor			3.1300	0.1000	0.3130		(28b)	
External Wall	49.6500	16.8900	32.7600	0.1500	4.9140		(29a)	
Corridor	4.5800	1.8900	2.6900	0.2500	0.6725		(29a)	
Total net area of external elements Aum(A, m2)			57.3600				(31)	
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		27.1292		(33)	
Party Wall 1			38.0500	0.0000	0.0000		(32)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								9.5544 (36)
Total fabric heat loss								(33) + (36) = 36.6836 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	17.2447	17.0514	16.8580	15.8913	15.6980	14.7313	14.7313	14.5380	15.1180	15.6980	16.0847	16.4714 (38)
Average = Sum(39)m / 12 =	53.9283	53.7350	53.5416	52.5749	52.3816	51.4149	51.4149	51.2216	51.8016	52.3816	52.7683	53.1549 (39)
												52.5266 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7335	0.7309	0.7283	0.7151	0.7125	0.6993	0.6993	0.6967	0.7046	0.7125	0.7177	0.7230 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy conte	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Energy content (annual)												Total = Sum(45)m = 1408.1991 (45)
Distribution loss (46)m = 0.15 x (45)m	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	1078.1968	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1132.1066	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	2059.0388	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2161.9908	(310a)
Electricity used for heat distribution	32.9410	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)		
mechanical ventilation fans (SFP = 0.7625)	170.9800	(330a)
Total electricity for the above, kWh/year	170.9800	(331)
Electricity for lighting (calculated in Appendix L)	323.3395	(332)
Total delivered energy for all uses	3788.4168	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3680.5557	0.2160	795.0000 (367)
Electrical energy for heat distribution	32.9410	0.5190	17.0964 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			812.0964 (373)
Space and water heating			812.0964 (376)
Pumps and fans	170.9800	0.5190	88.7386 (378)
Energy for lighting	323.3395	0.5190	167.8132 (379)
Total CO2, kg/year			1068.6482 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.5400 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		14.5400	ZC1
Total Floor Area	TFA	73.5200	
Assumed number of occupants	N	2.3285	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.5530	ZC2
CO2 emissions from cooking, equation (L16)		2.3787	ZC3
Total CO2 emissions		33.4717	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		33.4717	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.1632 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4132 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3512 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4478	0.4390	0.4303	0.3864	0.3776	0.3337	0.3337	0.3249	0.3512	0.3776	0.3951	0.4127 (22b)
	0.6003	0.5964	0.5926	0.5746	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			16.4900	1.3258	21.8617		(27)
Exposed Floor			3.1300	0.1300	0.4069		(28b)
External Wall	49.6500	16.4900	33.1600	0.1800	5.9688		(29a)
Corridor	4.5800	1.8900	2.6900	0.1800	0.4842		(29a)
Total net area of external elements Aum(A, m ²)			57.3600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.6116		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.5686 (36)
Total fabric heat loss						(33) + (36) =	38.1802 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.4091	36.1729	35.9414	34.8541	34.6506	33.7036	33.7036	33.5282	34.0684	34.6506	35.0622	35.4924 (38)
Heat transfer coeff	74.5893	74.3531	74.1217	73.0343	72.8309	71.8838	71.8838	71.7085	72.2486	72.8309	73.2424	73.6727 (39)
Average = Sum(39)m / 12 =												73.0333 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0145	1.0113	1.0082	0.9934	0.9906	0.9777	0.9777	0.9754	0.9827	0.9906	0.9962	1.0021 (40)
HLP (average)												0.9934 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy conte	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Energy content (annual)										Total = Sum(45)m =		1408.1991 (45)
Distribution loss (46)m = 0.15 x (45)m	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
Heat gains from water heating, kWh/month	85.8210	76.1264	81.0886	74.2704	73.9268	67.7004	66.5829	70.9061	70.1053	76.9367	79.3664	84.2892 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3070	16.2601	13.2236	10.0111	7.4834	6.3178	6.8266	8.8735	11.9100	15.1225	17.6502	18.8158	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	(71)
Water heating gains (Table 5)	115.3508	113.2833	108.9900	103.1533	99.3640	94.0283	89.4931	95.3039	97.3685	103.4096	110.2311	113.2919	(72)
Total internal gains	399.9539	397.9707	385.2706	364.7888	344.0400	323.9750	310.8872	316.6137	327.0851	347.7714	371.5522	389.3425	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				1.9200	10.6334	0.6300	0.7000	0.7700	6.2394 (74)			
Northeast				6.3200	11.2829	0.6300	0.7000	0.7700	21.7927 (75)			
East				2.1600	19.6403	0.6300	0.7000	0.7700	12.9650 (76)			
Southeast				6.0900	36.7938	0.6300	0.7000	0.7700	68.4801 (77)			
Solar gains	109.4772	198.2928	301.5531	422.4704	516.4299	531.3511	504.5419	431.8290	343.1398	227.4190	133.3072	92.2650 (83)
Total gains	509.4312	596.2635	686.8237	787.2591	860.4699	855.3261	815.4291	748.4428	670.2249	575.1904	504.8594	481.6075 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.4489	68.6663	68.8808	69.9063	70.1015	71.0251	71.0251	71.1988	70.6665	70.1015	69.7076	69.3005	
alpha	5.5633	5.5778	5.5921	5.6604	5.6734	5.7350	5.7350	5.7466	5.7111	5.6734	5.6472	5.6200	
util living area	0.9959	0.9896	0.9689	0.8943	0.7331	0.5307	0.3868	0.4385	0.7031	0.9400	0.9903	0.9970	(86)
MIT	20.0330	20.2045	20.4633	20.7638	20.9388	20.9919	20.9989	20.9978	20.9640	20.7148	20.3191	20.0055	(87)
Th 2	20.0712	20.0739	20.0765	20.0888	20.0912	20.1019	20.1019	20.1039	20.0978	20.0912	20.0865	20.0816	(88)
util rest of house	0.9946	0.9863	0.9592	0.8652	0.6773	0.4594	0.3085	0.3543	0.6265	0.9163	0.9867	0.9960	(89)
MIT 2	18.7866	19.0372	19.4091	19.8269	20.0366	20.0970	20.1015	20.1031	20.0719	19.7747	19.2145	18.7542	(90)
Living area fraction									fLA = Living area / (4) =			0.3678	(91)
MIT	19.2450	19.4665	19.7968	20.1715	20.3684	20.4261	20.4316	20.4321	20.4000	20.1205	19.6207	19.2144	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2450	19.4665	19.7968	20.1715	20.3684	20.4261	20.4316	20.4321	20.4000	20.1205	19.6207	19.2144	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	505.8630	586.4699	656.3785	683.4644	598.1050	415.2146	275.0661	288.3863	437.8537	527.5395	496.9107	479.0565	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1114.7375	1083.0663	985.5816	823.2046	631.3302	418.8029	275.4274	289.1381	455.1672	693.3834	917.0489	1106.1510	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	453.0026	333.7127	244.9271	100.6129	24.7196	0.0000	0.0000	0.0000	0.0000	123.3879	302.4995	466.5582	(98)
Space heating												2049.4206	(98)
Space heating per m2												27.8757	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2191.8937 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	453.0026	333.7127	244.9271	100.6129	24.7196	0.0000	0.0000	0.0000	0.0000	123.3879	302.4995	466.5582	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	484.4948	356.9120	261.9541	107.6074	26.4381	0.0000	0.0000	0.0000	0.0000	131.9656	323.5289	498.9928	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882	(64)
Efficiency of water heater (217)m	87.0192	86.5852	85.6602	83.6171	81.1057	79.8000	79.8000	79.8000	79.8000	84.0383	86.2567	79.8000	(216)
Fuel for water heating, kWh/month	221.3247	196.0825	208.2207	191.3122	193.3564	175.7022	168.8423	185.1357	184.7660	197.3809	203.2260	215.7211	(219)
Water heating fuel used												2341.0708	(219)
Annual totals kWh/year													
Space heating fuel - main system												2191.8937	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												323.3067	(232)
Total delivered energy for all uses												4931.2712	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2191.8937	0.2160	473.4490 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2341.0708	0.2160	505.6713 (264)
Space and water heating			979.1203 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	323.3067	0.5190	167.7962 (268)
Total CO2, kg/m2/year			1185.8415 (272)
Emissions per m2 for space and water heating			13.3177 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2823 (272b)
Emissions per m2 for pumps and fans			0.5294 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.3177 * 1.00) + 2.2823 + 0.5294, rounded to 2 d.p.			16.1300 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	114	Issued on Date	29/04/2022
Assessment Reference	114	Prop Type Ref	
Property			
SAP Rating	84 B	DER	15.04
Environmental	90 B	TER	16.44
CO ₂ Emissions (t/year)	0.69	% DER<TER	8.51
General Requirements Compliance	Fail	DFEE	28.59
		TFEE	30.75
		% DFEE<TFEE	7.05
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.44 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.04 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)30.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)28.6 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing South East: 6.24 m², No overhang
Windows facing South: 2.21 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)							
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)							
Number of intermittent fans					0 * 10 = 0.0000 (7a)							
Number of passive vents					0 * 10 = 0.0000 (7b)							
Number of flueless gas fires					0 * 40 = 0.0000 (7c)							
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)							
Pressure test					Yes							
Measured/design AP50					3.0000							
Infiltration rate					0.1500 (18)							
Number of sides sheltered					3 (19)							
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)							
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1163 (21)							
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)					
External Wall	19.8500	8.4500	11.4000	0.1500	1.7100		(29a)					
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)					
Total net area of external elements Aum(A, m2)			37.3500				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		17.1781		(33)					
Party Wall 1			37.0000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.3010 (36)					
Total fabric heat loss							(33) + (36) = 22.4791 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 11.1341	Feb 11.0123	Mar 10.8905	Apr 10.2816	May 10.1599	Jun 9.5510	Jul 9.5510	Aug 9.4292	Sep 9.7945	Oct 10.1599	Nov 10.4034	Dec 10.6470 (38)
Heat transfer coeff	33.6132	33.4914	33.3696	32.7607	32.6389	32.0301	32.0301	31.9083	32.2736	32.6389	32.8825	33.1260 (39)
Average = Sum(39)m / 12 =	32.7303 (39)											
HLP	Jan 0.6618	Feb 0.6594	Mar 0.6570	Apr 0.6450	May 0.6426	Jun 0.6306	Jul 0.6306	Aug 0.6282	Sep 0.6354	Oct 0.6426	Nov 0.6474	Dec 0.6522 (40)
HLP (average)	0.6444 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan 82.3820	Feb 79.3863	Mar 76.3906	Apr 73.3949	May 70.3992	Jun 67.4035	Jul 67.4035	Aug 70.3992	Sep 73.3949	Oct 76.3906	Nov 79.3863	Dec 82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												

store volume													110.0000	(47)
b) If manufacturer declared loss factor is not known :														
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152	(51)
Volume factor from Table 2a													1.0294	(52)
Temperature factor from Table 2b													0.6000	(53)
Enter (49) or (54) in (55)													1.0327	(55)
Total storage loss														
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)		
If cylinder contains dedicated solar storage														
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)		
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)	
Total heat required for water heating calculated for each month														
177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(62)		
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)		
Solar input (sum of months) = Sum(63)m =												0.0000	(63)	
Output from w/h														
177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(64)		
Total per year (kWh/year) = Sum(64)m =												1829.1942	(64)	
Heat gains from water heating, kWh/month														
84.8430	75.4698	80.8830	74.7574	74.8902	69.2597	68.7450	72.3625	71.2721	77.4089	79.0216	83.5613	(65)		

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.4839	11.9763	9.7398	7.3736	5.5119	4.6534	5.0281	6.5357	8.7723	11.1384	13.0002	13.8587 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	114.0363	112.3063	108.7138	103.8297	100.6589	96.1941	92.3992	97.2615	98.9891	104.0442	109.7522	112.3135 (72)
Total internal gains	325.5065	323.8179	314.0852	298.5244	283.0012	267.8182	257.8112	262.6320	270.4999	286.2317	304.2921	317.5716 (73)

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Southeast				6.2400	36.7938		0.4000		0.8000		0.7700		50.9147
South				2.2100	46.7521		0.4000		0.8000		0.7700		22.9127 (77)
Solar gains	73.8274	124.2516	166.4633	201.0539	220.9821	217.6723	210.5612	195.8614	178.4200	136.3256	88.1434		63.3710 (83)
Total gains	399.3338	448.0695	480.5485	499.5783	503.9832	485.4906	468.3724	458.4934	448.9198	422.5573	392.4355		380.9426 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	104.9316	105.3132	105.6975	107.6620	108.0637	110.1179	110.1179	110.5382	109.2869	108.0637	107.2633	106.4746
alpha	7.9954	8.0209	8.0465	8.1775	8.2042	8.3412	8.3412	8.3692	8.2858	8.2042	8.1509	8.0983
util living area												
	0.9801	0.9528	0.8925	0.7654	0.5985	0.4221	0.3009	0.3201	0.4953	0.7731	0.9457	0.9849 (86)
MIT	20.6551	20.7720	20.8883	20.9714	20.9961	20.9998	21.0000	21.0000	20.9993	20.9740	20.8251	20.6313 (87)
Th 2	20.3747	20.3768	20.3790	20.3896	20.3918	20.4025	20.4025	20.4047	20.3982	20.3918	20.3875	20.3832 (88)
util rest of house												
	0.9751	0.9424	0.8724	0.7336	0.5607	0.3827	0.2600	0.2787	0.4524	0.7361	0.9322	0.9810 (89)
MIT 2	19.9260	20.0911	20.2483	20.3601	20.3885	20.4024	20.4025	20.4046	20.3977	20.3663	20.1755	19.8996 (90)
Living area fraction									fLA = Living area / (4) =			0.5029 (91)
MIT	20.2926	20.4335	20.5701	20.6675	20.6940	20.7028	20.7030	20.7040	20.7002	20.6719	20.5022	20.2675 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2926	20.4335	20.5701	20.6675	20.6940	20.7028	20.7030	20.7040	20.7002	20.6719	20.5022	20.2675 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9744	0.9434	0.8789	0.7484	0.5796	0.4025	0.2806	0.2995	0.4740	0.7535	0.9349	0.9801 (94)
Useful gains	389.0916	422.7160	422.3306	373.8624	292.0911	195.4142	131.4154	137.3297	212.7811	318.4072	366.9047	373.3658 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	537.5630	520.2378	469.5140	385.5124	293.5554	195.4733	131.4178	137.3337	213.0138	328.7359	440.6970	532.2525 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	110.4627	65.5347	35.1045	8.3880	1.0895	0.0000	0.0000	0.0000	0.0000	7.6845	53.1304	118.2117 (98)
Space heating												399.6060 (98)
Space heating per m2												7.8678 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	399.6060	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	419.5863	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1829.1942	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1920.6539	(310a)
Electricity used for heat distribution	23.4024	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	121.9912	(330a)
Total electricity for the above, kWh/year	121.9912	(331)
Electricity for lighting (calculated in Appendix L)	238.1302	(332)
Total delivered energy for all uses	2700.3616	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	2614.7935	0.2160	564.7954 (367)
Electrical energy for heat distribution	23.4024	0.5190	12.1458 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			576.9412 (373)
Space and water heating			576.9412 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	238.1302	0.5190	123.5896 (379)
Total CO2, kg/year			763.8443 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.0400 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER	15.0400	ZC1
Total Floor Area	50.7900	TFA
Assumed number of occupants	1.7134	N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	EF
CO2 emissions from appliances, equation (L14)	17.4175	ZC2
CO2 emissions from cooking, equation (L16)	3.1526	ZC3
Total CO2 emissions	35.6101	ZC4
Residual CO2 emissions offset from biofuel CHP	0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year	0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000	ZC7
Net CO2 emissions	35.6101	ZC8

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SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					20.0000 / (5) = 0.1575 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4075 (18)
					3 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)					
External Wall	19.8500	8.4500	11.4000	0.1800	2.0520		(29a)					
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)					
Total net area of external elements Aum(A, m2)			37.3500				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	17.9545		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.9726 (36)					
Total fabric heat loss						(33) + (36) =	21.9271 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 24.3480	Feb 24.2160	Mar 24.0867	Apr 23.4794	May 23.3658	Jun 22.8368	Jul 22.8368	Aug 22.7389	Sep 23.0406	Oct 23.3658	Nov 23.5957	Dec 23.8360 (38)
Heat transfer coeff	46.2750	46.1431	46.0138	45.4065	45.2928	44.7639	44.7639	44.6659	44.9676	45.2928	45.5227	45.7630 (39)
Average = Sum(39)m / 12 =												45.4059 (39)
HLP	Jan 0.9111	Feb 0.9085	Mar 0.9060	Apr 0.8940	May 0.8918	Jun 0.8814	Jul 0.8814	Aug 0.8794	Sep 0.8854	Oct 0.8918	Nov 0.8963	Dec 0.9010 (40)
HLP (average)												0.8940 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)											Total = Sum(45)m =	1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

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If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W
Southeast					6.2400	36.7938	0.6300	0.7000	0.7700			70.1668 (77)
South					2.2100	46.7521	0.6300	0.7000	0.7700			31.5766 (78)
Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains	421.2115	488.9806	537.3716	569.4289	581.3281	561.5651	541.7662	526.3621	510.2428	468.0154	419.7157	398.8747 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.2201	76.4380	76.6527	77.6780	77.8729	78.7931	78.7931	78.9659	78.4360	77.8729	77.4796	77.0728	
alpha	6.0813	6.0959	6.1102	6.1785	6.1915	6.2529	6.2529	6.2644	6.2291	6.1915	6.1653	6.1382	
util living area	0.9885	0.9719	0.9340	0.8448	0.6945	0.5064	0.3631	0.3897	0.5970	0.8637	0.9717	0.9913 (86)	
MIT	20.3109	20.4822	20.6801	20.8674	20.9660	20.9959	20.9996	20.9993	20.9890	20.8704	20.5639	20.2768 (87)	
Th 2	20.1581	20.1603	20.1624	20.1726	20.1745	20.1834	20.1834	20.1850	20.1800	20.1745	20.1707	20.1666 (88)	
util rest of house	0.9851	0.9642	0.9172	0.8109	0.6422	0.4435	0.2960	0.3210	0.5307	0.8261	0.9627	0.9888 (89)	
MIT 2	19.2552	19.5011	19.7776	20.0303	20.1446	20.1809	20.1832	20.1848	20.1725	20.0408	19.6284	19.2126 (90)	
Living area fraction	19.7861	19.9945	20.2314	20.4513	20.5577	20.5907	20.5937	20.5944	20.5831	20.4580	20.0989	19.7477 (92)	
Temperature adjustment	19.7861	19.9945	20.2314	20.4513	20.5577	20.5907	20.5937	20.5944	20.5831	20.4580	20.0989	19.7477 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9833	0.9625	0.9187	0.8230	0.6670	0.4751	0.3298	0.3556	0.5637	0.8399	0.9618	0.9872 (94)	
Ext temp.	414.1915	470.6274	493.6920	468.6178	387.7457	266.7830	178.6577	187.1586	287.6369	393.0783	403.6675	393.7705 (95)	
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Month fracti	716.6180	696.5067	631.8341	524.5023	401.1892	268.1678	178.7745	187.3454	291.5290	446.4946	591.7431	711.5114 (97)	
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)	
Space heating	225.0053	151.7909	102.7777	40.2368	10.0020	0.0000	0.0000	0.0000	0.0000	39.7417	135.4144	236.3992 (98)	
Space heating per m2												941.3681 (98)	
												18.5345 (99)	

8c. Space cooling requirement

Not applicable

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1006.8108 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	225.0053	151.7909	102.7777	40.2368	10.0020	0.0000	0.0000	0.0000	0.0000	39.7417	135.4144	236.3992	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	240.6474	162.3432	109.9227	43.0340	10.6973	0.0000	0.0000	0.0000	0.0000	42.5045	144.8282	252.8334	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	85.5818	84.8645	83.7183	81.9485	80.4391	79.8000	79.8000	79.8000	79.8000	81.8665	84.4723	85.7739	(216)
Fuel for water heating, kWh/month	197.1972	175.4993	187.3609	172.3273	172.5923	156.2471	150.8144	164.4484	163.8315	178.8360	182.3607	192.2615	(219)
Water heating fuel used												2093.7767	(219)
Annual totals kWh/year													
Space heating fuel - main system												1006.8108	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												3418.9638	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1006.8108	0.2160	217.4711 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2093.7767	0.2160	452.2558 (264)
Space and water heating			669.7269 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			834.9642 (272)
Emissions per m2 for space and water heating			13.1862 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.1862 * 1.00) + 2.4870 + 0.7664, rounded to 2 d.p.			16.4400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	115	Issued on Date	29/04/2022
Assessment Reference	115	Prop Type Ref	
Property			
SAP Rating	83 B	DER	18.13
Environmental	88 B	TER	19.78
CO ₂ Emissions (t/year)	0.78	% DER<TER	8.35
General Requirements Compliance	Pass	DFEE	42.09
		TFEE	48.31
		% DFEE<TFEE	12.88
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 19.78 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 18.13 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)48.3 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)42.1 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing South East:	6.24 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Exposed floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			1.8900	1.0000	1.8900		(26)	
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)	
Exposed Floor			50.7900	0.1000	5.0790		(28b)	
External Wall	23.1000	8.4500	14.6500	0.1500	2.1975		(29a)	
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)	
Total net area of external elements Aum(A, m2)			91.3900				(31)	
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		22.7446		(33)	
Party Wall 1			33.8800	0.0000	0.0000		(32)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								11.3018 (36)
Total fabric heat loss						(33) + (36) =	34.0464 (37)	

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	11.1341	11.0123	10.8905	10.2816	10.1599	9.5510	9.5510	9.4292	9.7945	10.1599	10.4034	10.6470 (38)
Average = Sum(39)m / 12 =	45.1805	45.0587	44.9369	44.3280	44.2062	43.5974	43.5974	43.4756	43.8409	44.2062	44.4498	44.6933 (39)
	45.1805	45.0587	44.9369	44.3280	44.2062	43.5974	43.5974	43.4756	43.8409	44.2062	44.4498	44.2976 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8896	0.8872	0.8848	0.8728	0.8704	0.8584	0.8584	0.8560	0.8632	0.8704	0.8752	0.8800 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												
Average daily hot water use (litres/day)												1.7134 (42)
												74.8927 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy content (annual)	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1178.3544 (45)
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1006.0882 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1056.3926 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1920.6539 (310a)
Electricity used for heat distribution	29.7705 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	238.1302 (332)
Total delivered energy for all uses	3337.1680 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3326.3089	0.2160	718.4827 (367)
Electrical energy for heat distribution	29.7705	0.5190	15.4509 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			733.9336 (373)
Space and water heating			733.9336 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	238.1302	0.5190	123.5896 (379)
Total CO2, kg/year			920.8366 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			18.1300 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		18.1300 ZC1
Total Floor Area	TFA	50.7900
Assumed number of occupants	N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.4175 ZC2
CO2 emissions from cooking, equation (L16)		3.1526 ZC3
Total CO2 emissions		38.7001 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		38.7001 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) = 0.1575 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4075 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
Effective ac	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)
Exposed Floor			50.7900	0.1300	6.6027		(28b)
External Wall	23.1000	8.4500	14.6500	0.1800	2.6370		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Total net area of external elements Aum(A, m ²)			91.3900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1422		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.4576 (36)
Total fabric heat loss						(33) + (36) =	35.5998 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	24.3480	24.2160	24.0867	23.4794	23.3658	22.8368	22.8368	22.7389	23.0406	23.3658	23.5957	23.8360 (38)
Heat transfer coeff	59.9477	59.8158	59.6865	59.0792	58.9655	58.4366	58.4366	58.3386	58.6403	58.9655	59.1954	59.4357 (39)
Average = Sum(39)m / 12 =												59.0786 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1803	1.1777	1.1752	1.1632	1.1610	1.1506	1.1506	1.1486	1.1546	1.1610	1.1655	1.1702 (40)
HLP (average)												1.1632 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
Heat gains from water heating, kWh/month	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Southeast				6.2400	36.7938	0.6300	0.7000	0.7700	70.1668 (77)			
South				2.2100	46.7521	0.6300	0.7000	0.7700	31.5766 (78)			

Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains	421.2115	488.9806	537.3716	569.4289	581.3281	561.5651	541.7662	526.3621	510.2428	468.0154	419.7157	398.8747 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.8360	58.9658	59.0935	59.7010	59.8160	60.3575	60.3575	60.4588	60.1477	59.8160	59.5837	59.3428
alpha	4.9224	4.9311	4.9396	4.9801	4.9877	5.0238	5.0238	5.0306	5.0098	4.9877	4.9722	4.9562
util living area	0.9918	0.9823	0.9617	0.9118	0.8078	0.6344	0.4686	0.5013	0.7247	0.9233	0.9824	0.9936 (86)
MIT	19.9272	20.1119	20.3583	20.6391	20.8546	20.9672	20.9940	20.9916	20.9356	20.6657	20.2431	19.8906 (87)
Th 2	19.9358	19.9379	19.9399	19.9495	19.9514	19.9598	19.9598	19.9613	19.9565	19.9514	19.9477	19.9439 (88)
util rest of house	0.9892	0.9768	0.9497	0.8842	0.7513	0.5442	0.3610	0.3925	0.6397	0.8933	0.9760	0.9916 (89)
MIT 2	18.5334	18.8011	19.1532	19.5461	19.8167	19.9392	19.9577	19.9581	19.9104	19.5909	19.0001	18.4861 (90)
Living area fraction									fLA = Living area / (4) =			0.5029 (91)
MIT	19.2343	19.4602	19.7592	20.0957	20.3386	20.4561	20.4788	20.4778	20.4260	20.1314	19.6252	19.1924 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2343	19.4602	19.7592	20.0957	20.3386	20.4561	20.4788	20.4778	20.4260	20.1314	19.6252	19.1924 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9869	0.9737	0.9473	0.8885	0.7736	0.5886	0.4153	0.4474	0.6799	0.8992	0.9735	0.9896 (94)
Useful gains	415.6966	476.1120	509.0416	505.9325	449.7140	330.5185	225.0007	235.4759	346.9140	420.8275	408.5881	394.7386 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	895.2750	870.9304	791.3926	661.4342	509.3812	342.2120	226.6647	237.8957	370.9561	562.0240	741.4317	891.0821 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	356.8063	265.3179	210.0691	111.9612	44.3924	0.0000	0.0000	0.0000	0.0000	105.0502	239.6474	369.2796 (98)
Space heating												1702.5241 (98)
Space heating per m2										(98) / (4) =		33.5209 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1820.8814 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	356.8063	265.3179	210.0691	111.9612	44.3924	0.0000	0.0000	0.0000	0.0000	105.0502	239.6474	369.2796	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	381.6111	283.7625	224.6728	119.7446	47.4785	0.0000	0.0000	0.0000	0.0000	112.3532	256.3074	394.9514	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	86.7643	86.3379	85.5938	84.2025	82.1533	79.8000	79.8000	79.8000	79.8000	83.9464	85.9886	79.8000	(216)
Fuel for water heating, kWh/month	194.5098	172.5043	183.2555	167.7143	168.9910	156.2471	150.8144	164.4484	163.8315	174.4050	179.1450	189.7640	(219)
Water heating fuel used												2065.6302	(219)
Annual totals kWh/year													
Space heating fuel - main system												1820.8814	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												4204.8879	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1820.8814	0.2160	393.3104 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2065.6302	0.2160	446.1761 (264)
Space and water heating			839.4865 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			1004.7238 (272)
Emissions per m2 for space and water heating			16.5286 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.5286 * 1.00) + 2.4870 + 0.7664, rounded to 2 d.p.			19.7800 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	116				Issued on Date	29/04/2022
Assessment Reference	116	Prop Type Ref				
Property						
SAP Rating	84 B	DER	15.22	TER	16.64	
Environmental	90 B	% DER<TER	8.52			
CO ₂ Emissions (t/year)	0.69	DFEE	29.45	TFEE	31.81	
General Requirements Compliance	Fail	% DFEE<TFEE	7.41			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.64 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.22 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)31.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)29.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing South East: 6.24 m², No overhang
Windows facing South: 2.21 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

					main	secondary	other			total	m3 per hour	
					heating		heating					
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
											Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =										0.0000 / (5) =		0.0000 (8)
Pressure test										Yes		
Measured/design AP50										3.0000		
Infiltration rate										0.1500		(18)
Number of sides sheltered										3		(19)
Shelter factor										(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =		0.1163 (21)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)					
External Wall	23.1000	8.4500	14.6500	0.1500	2.1975		(29a)					
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)					
Total net area of external elements Aum(A, m2)			40.6000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		17.6656		(33)					
Party Wall 1			33.8800	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.5610 (36)					
Total fabric heat loss							(33) + (36) = 23.2266 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 11.1341	Feb 11.0123	Mar 10.8905	Apr 10.2816	May 10.1599	Jun 9.5510	Jul 9.5510	Aug 9.4292	Sep 9.7945	Oct 10.1599	Nov 10.4034	Dec 10.6470 (38)
Heat transfer coeff	34.3607	34.2389	34.1171	33.5082	33.3864	32.7776	32.7776	32.6558	33.0211	33.3864	33.6300	33.8735 (39)
Average = Sum(39)m / 12 =	33.4778 (39)											
HLP	Jan 0.6765	Feb 0.6741	Mar 0.6717	Apr 0.6597	May 0.6573	Jun 0.6454	Jul 0.6454	Aug 0.6430	Sep 0.6501	Oct 0.6573	Nov 0.6621	Dec 0.6669 (40)
HLP (average)	0.6591 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan 82.3820	Feb 79.3863	Mar 76.3906	Apr 73.3949	May 70.3992	Jun 67.4035	Jul 67.4035	Aug 70.3992	Sep 73.3949	Oct 76.3906	Nov 79.3863	Dec 82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (56)													
If cylinder contains dedicated solar storage													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (57)													
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month													
177.4469 156.7782 165.5372 149.6214 147.5136 133.0871 129.0318 139.9117 139.1394 155.0886 162.4461 173.5921 173.5921 (62)													
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
177.4469 156.7782 165.5372 149.6214 147.5136 133.0871 129.0318 139.9117 139.1394 155.0886 162.4461 173.5921 173.5921 (64)													
Total per year (kWh/year) = Sum(64)m =													1829.1942 (64)
Heat gains from water heating, kWh/month													
84.8430 75.4698 80.8830 74.7574 74.8902 69.2597 68.7450 72.3625 71.2721 77.4089 79.0216 83.5613 83.5613 (65)													

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
13.4839 11.9763 9.7398 7.3736 5.5119 4.6534 5.0281 6.5357 8.7723 11.1384 13.0002 13.8587 13.8587 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
149.2855 150.8347 146.9309 138.6204 128.1298 118.2701 111.6832 110.1341 114.0378 122.3484 132.8390 142.6987 142.6987 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 (69)													
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													
-68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 (71)													
Water heating gains (Table 5)													
114.0363 112.3063 108.7138 103.8297 100.6589 96.1941 92.3992 97.2615 98.9891 104.0442 109.7522 112.3135 112.3135 (72)													
Total internal gains	325.5065	323.8179	314.0852	298.5244	283.0012	267.8182	257.8112	262.6320	270.4999	286.2317	304.2921	317.5716	317.5716 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
Southeast					6.2400	36.7938	0.4000	0.8000			0.7700			50.9147 (77)
South					2.2100	46.7521	0.4000	0.8000			0.7700			22.9127 (78)
Solar gains	73.8274	124.2516	166.4633	201.0539	220.9821	217.6723	210.5612	195.8614	178.4200	136.3256	88.1434			63.3710 (83)
Total gains	399.3338	448.0695	480.5485	499.5783	503.9832	485.4906	468.3724	458.4934	448.9198	422.5573	392.4355			380.9426 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
tau	102.6489	103.0140	103.3817	105.2603	105.6442	107.6067	107.6067	108.0079	106.8130	105.6442	104.8791	104.1250	104.1250
alpha	7.8433	7.8676	7.8921	8.0174	8.0429	8.1738	8.1738	8.2005	8.1209	8.0429	7.9919	7.9417	7.9417
util living area	0.9815	0.9564	0.9000	0.7778	0.6112	0.4318	0.3079	0.3276	0.5065	0.7854	0.9500	0.9860	0.9860 (86)
MIT	20.6320	20.7516	20.8740	20.9657	20.9950	20.9997	21.0000	21.0000	20.9991	20.9688	20.8079	20.6077	20.6077 (87)
Th 2	20.3616	20.3637	20.3659	20.3765	20.3787	20.3894	20.3894	20.3915	20.3851	20.3787	20.3744	20.3701	20.3701 (88)
util rest of house	0.9768	0.9465	0.8804	0.7457	0.5721	0.3908	0.2652	0.2843	0.4618	0.7482	0.9371	0.9823	0.9823 (89)
MIT 2	19.8820	20.0513	20.2176	20.3409	20.3744	20.3892	20.3893	20.3915	20.3844	20.3480	20.1406	19.8548	19.8548 (90)
Living area fraction									fLA = Living area / (4) =			0.5029	0.5029 (91)
MIT	20.2592	20.4034	20.5477	20.6551	20.6865	20.6962	20.6964	20.6975	20.6935	20.6601	20.4761	20.2334	20.2334 (92)
Temperature adjustment												0.0000	0.0000
adjusted MIT	20.2592	20.4034	20.5477	20.6551	20.6865	20.6962	20.6964	20.6975	20.6935	20.6601	20.4761	20.2334	20.2334 (93)

8. Space heating requirement

Utilisation	0.9760	0.9471	0.8864	0.7603	0.5916	0.4114	0.2867	0.3061	0.4843	0.7654	0.9394	0.9814	0.9814 (94)
Useful gains	389.7316	424.3886	425.9349	379.8513	298.1356	199.7359	134.2668	140.3312	217.4101	323.4429	368.6451	373.8417	373.8417 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	4.2000 (96)
Heat loss rate W	548.3668	530.8195	479.2663	393.8908	300.0260	199.8189	134.2703	140.3372	217.7251	335.8724	449.8393	543.1081	543.1081 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	118.0246	71.5216	39.6786	10.1084	1.4065	0.0000	0.0000	0.0000	0.0000	9.2475	58.4598	125.9343	125.9343 (98)
Space heating												434.3813	434.3813 (98)
Space heating per m2										(98) / (4) =		8.5525	8.5525 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	434.3813	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	456.1004	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1829.1942	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1920.6539	(310a)
Electricity used for heat distribution	23.7675	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	121.9912	(330a)
Total electricity for the above, kWh/year	121.9912	(331)
Electricity for lighting (calculated in Appendix L)	238.1302	(332)
Total delivered energy for all uses	2736.8757	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	2655.5913	0.2160	573.6077 (367)
Electrical energy for heat distribution	23.7675	0.5190	12.3354 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			585.9431 (373)
Space and water heating			585.9431 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	238.1302	0.5190	123.5896 (379)
Total CO2, kg/year			772.8461 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.2200 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER	15.2200	ZC1
Total Floor Area	50.7900	TFA
Assumed number of occupants	1.7134	N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	EF
CO2 emissions from appliances, equation (L14)	17.4175	ZC2
CO2 emissions from cooking, equation (L16)	3.1526	ZC3
Total CO2 emissions	35.7901	ZC4
Residual CO2 emissions offset from biofuel CHP	0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year	0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000	ZC7
Net CO2 emissions	35.7901	ZC8

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					20.0000 / (5) = 0.1575 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4075 (18)
					3 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
Effective ac	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)					
External Wall	23.1000	8.4500	14.6500	0.1800	2.6370		(29a)					
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)					
Total net area of external elements Aum(A, m2)			40.6000				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.5395		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.2296 (36)					
Total fabric heat loss						(33) + (36) =	22.7691 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 24.3480	Feb 24.2160	Mar 24.0867	Apr 23.4794	May 23.3658	Jun 22.8368	Jul 22.8368	Aug 22.7389	Sep 23.0406	Oct 23.3658	Nov 23.5957	Dec 23.8360 (38)
Heat transfer coeff	47.1170	46.9851	46.8558	46.2485	46.1348	45.6059	45.6059	45.5079	45.8096	46.1348	46.3647	46.6050 (39)
Average = Sum(39)m / 12 =												46.2479 (39)
HLP	Jan 0.9277	Feb 0.9251	Mar 0.9225	Apr 0.9106	May 0.9083	Jun 0.8979	Jul 0.8979	Aug 0.8960	Sep 0.9019	Oct 0.9083	Nov 0.9129	Dec 0.9176 (40)
HLP (average)												0.9106 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan 82.3820	Feb 79.3863	Mar 76.3906	Apr 73.3949	May 70.3992	Jun 67.4035	Jul 67.4035	Aug 70.3992	Sep 73.3949	Oct 76.3906	Nov 79.3863	Dec 82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c				Access factor Table 6d	Gains W
Southeast					6.2400	36.7938	0.6300	0.7000				0.7700	70.1668 (77)
South					2.2100	46.7521	0.6300	0.7000				0.7700	31.5766 (78)
Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)	
Total gains	421.2115	488.9806	537.3716	569.4289	581.3281	561.5651	541.7662	526.3621	510.2428	468.0154	419.7157	398.8747 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	74.8580	75.0681	75.2753	76.2638	76.4516	77.3383	77.3383	77.5048	76.9944	76.4516	76.0726	75.6803
alpha	5.9905	6.0045	6.0184	6.0843	6.0968	6.1559	6.1559	6.1670	6.1330	6.0968	6.0715	6.0454
util living area	0.9889	0.9730	0.9369	0.8513	0.7037	0.5153	0.3699	0.3969	0.6066	0.8695	0.9729	0.9916 (86)
MIT	20.2863	20.4588	20.6606	20.8552	20.9614	20.9951	20.9995	20.9992	20.9872	20.8591	20.5437	20.2519 (87)
Th 2	20.1440	20.1462	20.1484	20.1585	20.1604	20.1693	20.1693	20.1709	20.1658	20.1604	20.1566	20.1526 (88)
util rest of house	0.9856	0.9656	0.9205	0.8177	0.6508	0.4504	0.3003	0.3258	0.5385	0.8324	0.9641	0.9891 (89)
MIT 2	19.2087	19.4566	19.7392	20.0026	20.1264	20.1663	20.1691	20.1706	20.1571	20.0145	19.5885	19.1658 (90)
Living area fraction	19.7506	19.9606	20.2025	20.4313	20.5463	20.5831	20.5866	20.5872	20.5745	20.4392	20.0688	19.7120 (92)
Temperature adjustment	19.7506	19.9606	20.2025	20.4313	20.5463	20.5831	20.5866	20.5872	20.5745	20.4392	20.0688	19.7120 (93)
adjusted MIT	19.7506	19.9606	20.2025	20.4313	20.5463	20.5831	20.5866	20.5872	20.5745	20.4392	20.0688	19.7120 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9838	0.9637	0.9217	0.8292	0.6757	0.4829	0.3353	0.3616	0.5724	0.8456	0.9630	0.9875	(94)
Useful gains	414.3677	471.2247	495.2826	472.1728	392.8082	271.2034	181.6682	190.3214	292.0435	395.7686	404.2071	393.8892	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	727.9850	707.6224	642.0408	533.3063	408.1214	272.8626	181.8138	190.5525	296.5960	453.9310	601.2941	722.9350	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	233.3313	158.8593	109.1881	44.0161	11.3930	0.0000	0.0000	0.0000	0.0000	43.2728	141.9026	244.8100	(98)
Space heating												986.7733	(98)
Space heating per m2												19.4285	(99)
										(98) / (4) =			

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1055.3725 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	233.3313	158.8593	109.1881	44.0161	11.3930	0.0000	0.0000	0.0000	0.0000	43.2728	141.9026	244.8100	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	249.5522	169.9030	116.7787	47.0761	12.1850	0.0000	0.0000	0.0000	0.0000	46.2811	151.7675	261.8289	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	85.6783	84.9860	83.8697	82.1068	80.5220	79.8000	79.8000	79.8000	79.8000	82.0121	84.5958	85.8659	(216)
Fuel for water heating, kWh/month	196.9753	175.2483	187.0226	171.9951	172.4146	156.2471	150.8144	164.4484	163.8315	178.5184	182.0944	192.0554	(219)
Water heating fuel used												2091.6656	(219)
Annual totals kWh/year													
Space heating fuel - main system												1055.3725	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												3465.4144	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1055.3725	0.2160	227.9605 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2091.6656	0.2160	451.7998 (264)
Space and water heating			679.7602 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			844.9975 (272)
Emissions per m2 for space and water heating			13.3837 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.3837 * 1.00) + 2.4870 + 0.7664, rounded to 2 d.p.			16.6400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	117	Issued on Date	29/04/2022
Assessment Reference	117	Prop Type Ref	
Property			
SAP Rating	85 B	DER	13.94
Environmental	90 B	TER	15.10
CO ₂ Emissions (t/year)	0.88	% DER<TER	7.68
General Requirements Compliance	Fail	DFEE	31.81
		TFEE	35.64
		% DFEE<TFEE	10.73
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 74 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 15.10 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.94 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)35.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)31.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading: Average
Windows facing South East: 6.24 m², No overhang
Windows facing South: 2.21 m², No overhang
Windows facing South West: 9.35 m², No overhang
Windows facing West: 1.97 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

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Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

					main heating	+	secondary heating	+	other	=	total	m3 per hour
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =										0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50											3.0000	
Infiltration rate											0.1500	(18)
Number of sides sheltered											2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =										0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =										0.1275	(21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			19.7700	1.1450	22.6374		(27)					
External Wall	52.9500	19.7700	33.1800	0.1500	4.9770		(29a)					
Corridor	5.4000	1.8900	3.5100	0.2500	0.8775		(29a)					
Total net area of external elements Aum(A, m2)			58.3500				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		30.3819		(33)					
Party Wall 1			34.8500	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1430 (36)					
Total fabric heat loss							(33) + (36) = 39.5249 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 17.2447	Feb 17.0514	Mar 16.8580	Apr 15.8913	May 15.6980	Jun 14.7313	Jul 14.7313	Aug 14.5380	Sep 15.1180	Oct 15.6980	Nov 16.0847	Dec 16.4714 (38)
Heat transfer coeff	56.7696	56.5763	56.3829	55.4163	55.2229	54.2562	54.2562	54.0629	54.6429	55.2229	55.6096	55.9963 (39)
Average = Sum(39)m / 12 =	55.3679 (39)											
HLP	Jan 0.7722	Feb 0.7695	Mar 0.7669	Apr 0.7538	May 0.7511	Jun 0.7380	Jul 0.7380	Aug 0.7353	Sep 0.7432	Oct 0.7511	Nov 0.7564	Dec 0.7616 (40)
HLP (average)	0.7531 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	Jan 98.4511	Feb 94.8710	Mar 91.2910	Apr 87.7110	May 84.1309	Jun 80.5509	Jul 80.5509	Aug 84.1309	Sep 87.7110	Oct 91.2910	Nov 94.8710	Dec 98.4511 (44)
Energy conte	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Energy content (annual)												Total = Sum(45)m = 1408.1991 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												

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Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (56)													
If cylinder contains dedicated solar storage													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (57)													
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month													
201.2769 177.6201 187.0442 168.3717 165.5050 148.6122 143.4181 156.4202 155.8451 174.5575 183.6979 196.6701 196.6701 (62)													
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
201.2769 177.6201 187.0442 168.3717 165.5050 148.6122 143.4181 156.4202 155.8451 174.5575 183.6979 196.6701 196.6701 (64)													
Total per year (kWh/year) = Sum(64)m =													2059.0388 (64)
Heat gains from water heating, kWh/month													
92.7665 82.3997 88.0341 80.9919 80.8723 74.4219 73.5284 77.8516 76.8268 83.8823 86.0878 91.2347 (65)													

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)													
(66)m 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 (66)													
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
18.3088 16.2617 13.2249 10.0121 7.4842 6.3185 6.8273 8.8744 11.9112 15.1240 17.6520 18.8177 18.8177 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
205.3693 207.5004 202.1301 190.6974 176.2657 162.7019 153.6405 151.5094 156.8797 168.3123 182.7441 196.3078 196.3078 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 (69)													
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													
-93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 (71)													
Water heating gains (Table 5)													
124.6861 122.6187 118.3254 112.4887 108.6993 103.3637 98.8285 104.6393 106.7039 112.7450 119.5664 122.6273 122.6273 (72)													
Total internal gains													
406.2912 404.3077 391.6074 371.1252 350.3761 330.3110 317.2233 322.9500 333.4217 354.1083 377.8894 395.6798 395.6798 (73)													

6. Solar gains

[Jan]													
Area m2													
Solar flux Table 6a W/m2													
Specific data or Table 6b													
Specific data or Table 6c													
Access factor Table 6d													
Gains W													
Southeast	6.2400	36.7938	0.4000	0.8000	0.7700	50.9147 (77)							
South	2.2100	46.7521	0.4000	0.8000	0.7700	22.9127 (78)							
Southwest	9.3500	36.7938	0.4000	0.8000	0.7700	76.2904 (79)							
West	1.9700	19.6403	0.4000	0.8000	0.7700	8.5802 (80)							
Solar gains	158.6979	270.9870	371.9096	461.6762	517.1520	513.2277	494.8979	453.6712	403.0932	299.8653	190.2202	135.7156 (83)	
Total gains	564.9891	675.2948	763.5169	832.8014	867.5282	843.5387	812.1211	776.6213	736.5149	653.9736	568.1096	531.3954 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
tau 89.9347 90.2420 90.5514 92.1310 92.4536 94.1008 94.1008 94.4373 93.4349 92.4536 91.8107 91.1767 91.1767 (86)													
alpha 6.9956 7.0161 7.0368 7.1421 7.1636 7.2734 7.2734 7.2958 7.2290 7.1636 7.1207 7.0784 7.0784 (87)													
util living area 0.9890 0.9652 0.9034 0.7649 0.5863 0.4113 0.2939 0.3202 0.5099 0.8137 0.9678 0.9923 0.9923 (88)													
MIT 20.4660 20.6444 20.8245 20.9538 20.9932 20.9996 21.0000 20.9999 20.9980 20.9419 20.6929 20.4317 20.4317 (89)													
Th 2 20.2775 20.2798 20.2821 20.2936 20.2959 20.3074 20.3074 20.3097 20.3028 20.2959 20.2913 20.2867 20.2867 (90)													
util rest of house 0.9859 0.9565 0.8831 0.7298 0.5439 0.3669 0.2477 0.2722 0.4593 0.7747 0.9582 0.9901 0.9901 (91)													
MIT 2 19.5743 19.8291 20.0754 20.2460 20.2901 20.3071 20.3074 20.3097 20.3014 20.2378 19.9100 19.5323 19.5323 (92)													
Living area fraction fLA = Living area / (4) =													
MIT 19.9022 20.1289 20.3509 20.5063 20.5487 20.5618 20.5621 20.5636 20.5576 20.4967 20.1979 19.8631 19.8631 (93)													
Temperature adjustment													
adjusted MIT 19.9022 20.1289 20.3509 20.5063 20.5487 20.5618 20.5621 20.5636 20.5576 20.4967 20.1979 19.8631 19.8631 (94)													

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.9840 0.9544 0.8852 0.7407 0.5592 0.3832 0.2647 0.2898 0.4779 0.7863 0.9568 0.9884 0.9884 (94)													
Useful gains	555.9318	644.5010	675.8881	616.8285	485.1215	323.2778	214.9595	225.0750	351.9614	514.2465	543.5409	525.2536	525.2536 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	4.2000 (96)
Heat loss rate W	885.7334	861.5951	780.9539	643.1784	488.6489	323.4649	214.9695	225.0940	352.8633	546.5273	728.3705	877.0750	877.0750 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	245.3724	145.8872	78.1690	18.9719	2.6244	0.0000	0.0000	0.0000	0.0000	24.0169	133.0773	261.7551	261.7551 (98)
Space heating													
Space heating per m2													
(98) / (4) =													12.3759 (99)

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8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	909.8743 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	955.3680 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2059.0388 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2161.9908 (310a)
Electricity used for heat distribution	31.1736 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	170.9800 (330a)
Total electricity for the above, kWh/year	170.9800 (331)
Electricity for lighting (calculated in Appendix L)	323.3395 (332)
Total delivered energy for all uses	3611.6782 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3483.0824	0.2160	752.3458 (367)
Electrical energy for heat distribution	31.1736	0.5190	16.1791 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			768.5249 (373)
Space and water heating			768.5249 (376)
Pumps and fans	170.9800	0.5190	88.7386 (378)
Energy for lighting	323.3395	0.5190	167.8132 (379)
Total CO2, kg/year			1025.0767 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			13.9400 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		13.9400 ZC1
Total Floor Area	TFA	73.5200
Assumed number of occupants	N	2.3285
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.5530 ZC2
CO2 emissions from cooking, equation (L16)		2.3787 ZC3
Total CO2 emissions		32.8717 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		32.8717 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1632 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4132 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3512 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4478	0.4390	0.4303	0.3864	0.3776	0.3337	0.3337	0.3249	0.3512	0.3776	0.3951	0.4127 (22b)
	0.6003	0.5964	0.5926	0.5746	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			16.4900	1.3258	21.8617			(27)					
External Wall	52.9500	16.4900	36.4600	0.1800	6.5628			(29a)					
Corridor	5.4000	1.8900	3.5100	0.1800	0.6318			(29a)					
Total net area of external elements Aum(A, m2)			58.3500					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.9463			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								7.0636 (36)					
Total fabric heat loss						(33) + (36) =		38.0099 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 36.4091	Feb 36.1729	Mar 35.9414	Apr 34.8541	May 34.6506	Jun 33.7036	Jul 33.7036	Aug 33.5282	Sep 34.0684	Oct 34.6506	Nov 35.0622	Dec 35.4924	(38)
Heat transfer coeff	74.4190	74.1828	73.9514	72.8640	72.6606	71.7135	71.7135	71.5382	72.0783	72.6606	73.0721	73.5024	(39)
Average = Sum(39)m / 12 =												72.8630	(39)
HLP	Jan 1.0122	Feb 1.0090	Mar 1.0059	Apr 0.9911	May 0.9883	Jun 0.9754	Jul 0.9754	Aug 0.9730	Sep 0.9804	Oct 0.9883	Nov 0.9939	Dec 0.9998	(40)
HLP (average)												0.9911	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy content (annual)	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1408.1991 (45)
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

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If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
	85.8210	76.1264	81.0886	74.2704	73.9268	67.7004	66.5829	70.9061	70.1053	76.9367	79.3664	84.2892 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3070	16.2601	13.2236	10.0111	7.4834	6.3178	6.8266	8.8735	11.9100	15.1225	17.6502	18.8158	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	(71)
Water heating gains (Table 5)	115.3508	113.2833	108.9900	103.1533	99.3640	94.0283	89.4931	95.3039	97.3685	103.4096	110.2311	113.2919	(72)
Total internal gains	399.9539	397.9707	385.2706	364.7888	344.0400	323.9750	310.8872	316.6137	327.0851	347.7714	371.5522	389.3425	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g	Specific data or Table 6b	FF	Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast				5.2100	36.7938		0.6300		0.7000	0.7700	58.5847 (77)	
South				1.8400	46.7521		0.6300		0.7000	0.7700	26.2900 (78)	
Southwest				7.8000	36.7938		0.6300		0.7000	0.7700	87.7085 (79)	
West				1.6400	19.6403		0.6300		0.7000	0.7700	9.8438 (80)	
Solar gains	182.4270	311.5043	427.5134	530.6984	594.4675	589.9567	568.8863	521.4963	463.3582	344.6994	218.6622	156.0085 (83)
Total gains	582.3809	709.4749	812.7841	895.4872	938.5075	913.9316	879.7735	838.1100	790.4433	692.4707	590.2145	545.3510 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6055	68.8239	69.0394	70.0696	70.2658	71.1937	71.1937	71.3683	70.8334	70.2658	69.8701	69.4611	
alpha	5.5737	5.5883	5.6026	5.6713	5.6844	5.7462	5.7462	5.7579	5.7222	5.6844	5.6580	5.6307	
util living area	0.9922	0.9772	0.9390	0.8434	0.6850	0.4974	0.3580	0.3915	0.6120	0.8849	0.9800	0.9944	(86)
MIT	20.1287	20.3430	20.5945	20.8337	20.9567	20.9942	20.9993	20.9988	20.9820	20.8119	20.4251	20.0904	(87)
Th 2	20.0732	20.0758	20.0784	20.0908	20.0931	20.1039	20.1039	20.1059	20.0997	20.0931	20.0884	20.0835	(88)
util rest of house	0.9898	0.9706	0.9225	0.8076	0.6290	0.4299	0.2855	0.3160	0.5391	0.8487	0.9731	0.9926	(89)
MIT 2	18.9267	19.2363	19.5898	19.9131	20.0555	20.1004	20.1036	20.1054	20.0875	19.8964	19.3668	18.8791	(90)
Living area fraction	19.3688	19.6434	19.9593	20.2517	20.3869	20.4291	20.4330	20.4340	20.4165	20.2331	19.7560	19.3246	(92)
Temperature adjustment	19.3688	19.6434	19.9593	20.2517	20.3869	20.4291	20.4330	20.4340	20.4165	20.2331	19.7560	19.3246	(93)
adjusted MIT	19.3688	19.6434	19.9593	20.2517	20.3869	20.4291	20.4330	20.4340	20.4165	20.2331	19.7560	19.3246	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9874	0.9668	0.9201	0.8144	0.6477	0.4546	0.3122	0.3438	0.5653	0.8549	0.9700	0.9907	(94)
Ext temp.	575.0202	685.9200	747.8324	729.2656	607.8729	415.4799	274.6429	288.1747	446.8606	592.0102	572.4993	540.2693	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1121.4021	1093.7042	995.3329	827.1285	631.1973	418.0258	274.8792	288.5832	455.2835	699.9457	924.8020	1111.6934	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	406.5081	274.0310	184.1403	70.4612	17.3534	0.0000	0.0000	0.0000	0.0000	80.3041	253.6580	425.1395	(98)
Space heating per m2												1711.5957	(98)
												23.2807	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1830.5836 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	406.5081	274.0310	184.1403	70.4612	17.3534	0.0000	0.0000	0.0000	0.0000	80.3041	253.6580	425.1395	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	434.7680	293.0813	196.9415	75.3596	18.5598	0.0000	0.0000	0.0000	0.0000	85.8867	271.2920	454.6947	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882	(64)
Efficiency of water heater (217)m	86.7602	86.0844	84.8989	82.7932	80.7512	79.8000	79.8000	79.8000	79.8000	83.0011	85.7986	86.9264	(216)
Fuel for water heating, kWh/month	221.9854	197.2232	210.0879	193.2161	194.2052	175.7022	168.8423	185.1357	184.7660	199.8474	204.3109	216.2615	(219)
Water heating fuel used												2351.5838	(219)
Annual totals kWh/year													
Space heating fuel - main system												1830.5836	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												323.3067	(232)
Total delivered energy for all uses												4580.4741	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1830.5836	0.2160	395.4061 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2351.5838	0.2160	507.9421 (264)
Space and water heating			903.3481 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	323.3067	0.5190	167.7962 (268)
Total CO2, kg/m2/year			1110.0693 (272)
Emissions per m2 for space and water heating			12.2871 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2823 (272b)
Emissions per m2 for pumps and fans			0.5294 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.2871 * 1.00) + 2.2823 + 0.5294, rounded to 2 d.p.			15.1000 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	118	Issued on Date	29/04/2022
Assessment Reference	118	Prop Type Ref	
Property			
SAP Rating	85 B	DER	15.52
Environmental	89 B	TER	16.79
CO ₂ Emissions (t/year)	0.93	% DER<TER	7.59
General Requirements Compliance	Pass	DFEE	38.89
		TFEE	43.38
		% DFEE<TFEE	10.35
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.79 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.52 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)43.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)38.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading: Average
Windows facing West: 5.88 m², No overhang
Windows facing North West: 7.07 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												75.6500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			12.9500	1.1450	14.8282		(27)
External Wall	35.0800	12.9500	22.1300	0.1500	3.3195		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Core	18.2300		18.2300	0.2500	4.5575		(29a)
Total net area of external elements Aum(A, m ²)			70.8100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	28.4977			(33)
Party Wall 1			18.3000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.0220 (36)
Total fabric heat loss							(33) + (36) = 37.5197 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	17.0688	16.8774	16.6860	15.7292	15.5379	14.5811	14.5811	14.3897	14.9638	15.5379	15.9206	16.3033 (38)
Heat transfer coeff	54.5885	54.3972	54.2058	53.2490	53.0576	52.1008	52.1008	51.9094	52.4835	53.0576	53.4403	53.8231 (39)
Average = Sum(39)m / 12 =												53.2011 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7502	0.7475	0.7449	0.7317	0.7291	0.7160	0.7160	0.7133	0.7212	0.7291	0.7344	0.7396 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy content (annual)	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1401.8427 (45)
	21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
	Solar input (sum of months) = Sum (63)m =											0.0000 (63)	
Output from w/h													
	200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(64)
	Total per year (kWh/year) = Sum (64)m =											2052.6825 (64)	
Heat gains from water heating, kWh/month													
	92.5474	82.2081	87.8363	80.8195	80.7069	74.2791	73.3961	77.6998	76.6732	83.7032	85.8924	91.0225	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726 (66)
Lighting gains	(calculated in Appendix L, equation L9 or L9a), also see Table 5											
	18.2553	16.2142	13.1863	9.9829	7.4623	6.3000	6.8074	8.8485	11.8764	15.0798	17.6004	18.7627 (67)
Appliances gains	(calculated in Appendix L, equation L13 or L13a), also see Table 5											
	203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872 (68)
Cooking gains	(calculated in Appendix L, equation L15 or L15a), also see Table 5											
	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581 (71)
Water heating gains (Table 5)												
	124.3916	122.3335	118.0596	112.2492	108.4770	103.1654	98.6507	104.4353	106.4905	112.5044	119.2950	122.3421 (72)
Total internal gains												
	403.9925	402.0068	389.3790	369.0270	348.4216	328.4959	315.5019	321.2141	331.6232	352.1788	375.8026	393.4637 (73)

[Jan											Area		Solar flux		g		FF		Access		Gains		
											m2		Table 6a		or Table 6b		or Table 6c		factor		W		
																			Table 6d				
West											5.8800	19.6403		0.4000		0.8000		0.7700		25.6099		(80)	
Northwest											7.0700	11.2829		0.4000		0.8000		0.7700		17.6899		(81)	
Solar gains	43.2998	86.1067	147.3804	226.8726	290.6833	303.6424	286.5514	237.3201	175.0084	103.4509	54.1910	35.5068	(83)										
Total gains	447.2923	488.1134	536.7594	595.8996	639.1049	632.1383	602.0533	558.5342	506.6316	455.6297	429.9935	428.9705	(84)										

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil/m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	92.5739	92.8996	93.2275	94.9027	95.2450	96.9941	96.9941	97.3517	96.2868	95.2450	94.5629	93.8905
alpha	7.1716	7.1933	7.2152	7.3268	7.3497	7.4663	7.4663	7.4901	7.4191	7.3497	7.3042	7.2594
util living area	0.9969	0.9933	0.9788	0.9113	0.7424	0.5254	0.3806	0.4271	0.6968	0.9465	0.9921	0.9977 (86)
MIT	20.3517	20.4556	20.6369	20.8586	20.9735	20.9981	20.9999	20.9997	20.9873	20.8315	20.5585	20.3357 (87)
Th 2	20.2967	20.2990	20.3013	20.3129	20.3152	20.3268	20.3268	20.3291	20.3221	20.3152	20.3106	20.3060 (88)
util rest of house	0.9960	0.9913	0.9725	0.8884	0.6968	0.4711	0.3225	0.3650	0.6355	0.9271	0.9894	0.9969 (89)
MIT 2	19.4247	19.5774	19.8398	20.1526	20.2910	20.3256	20.3267	20.3289	20.3127	20.1247	19.7368	19.4087 (90)
Living area fraction									fLA = Living area / (4) =			0.3848 (91)
MIT	19.7814	19.9153	20.1465	20.4242	20.5536	20.5843	20.5857	20.5870	20.5723	20.3967	20.0530	19.7654 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7814	19.9153	20.1465	20.4242	20.5536	20.5843	20.5857	20.5870	20.5723	20.3967	20.0530	19.7654 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9951	0.9899	0.9708	0.8924	0.7131	0.4919	0.3448	0.3889	0.6587	0.9297	0.9881	0.9962 (94)
Useful gains	445.0837	483.2012	521.0751	531.7905	455.7241	310.9803	207.6105	217.2325	333.7154	423.6168	424.8654	427.3403 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
	845.1055	816.7890	739.7207	613.6529	469.7512	311.7893	207.6586	217.3455	339.6882	519.7883	692.2114	837.7750 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
	297.6162	224.1709	162.6724	58.9409	10.4362	0.0000	0.0000	0.0000	0.0000	71.5516	192.4891	305.3634 (98)
Space heating												1323.2408 (99)
Space heating per m2												18.1839 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1323.2408 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1389.4028 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2052.6825 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2155.3166 (310a)
Electricity used for heat distribution	35.4472 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	169.2357 (330a)
Total electricity for the above, kWh/year	169.2357 (331)
Electricity for lighting (calculated in Appendix L)	322.3944 (332)
Total delivered energy for all uses	4036.3495 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3960.5803	0.2160	855.4853 (367)
Electrical energy for heat distribution	35.4472	0.5190	18.3971 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			873.8824 (373)
Space and water heating			873.8824 (376)
Pumps and fans	169.2357	0.5190	87.8333 (378)
Energy for lighting	322.3944	0.5190	167.3227 (379)
Total CO2, kg/year			1129.0385 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.5200 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		15.5200 ZC1
Total Floor Area	TFA	72.7700
Assumed number of occupants	N	2.3115
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.5855 ZC2
CO2 emissions from cooking, equation (L16)		2.3976 ZC3
Total CO2 emissions		34.5031 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		34.5031 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1649 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4149 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3527 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4497	0.4408	0.4320	0.3879	0.3791	0.3350	0.3350	0.3262	0.3527	0.3791	0.3968	0.4144 (22b)
Effective ac	0.6011	0.5972	0.5933	0.5752	0.5719	0.5561	0.5561	0.5532	0.5622	0.5719	0.5787	0.5859 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			12.9500	1.3258	17.1686		(27)
External Wall	35.0800	12.9500	22.1300	0.1800	3.9834		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Core	18.2300		18.2300	0.1800	3.2814		(29a)
Total net area of external elements Aum(A, m ²)			70.8100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.1332		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.9308 (36)
Total fabric heat loss						(33) + (36) =	36.0640 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.0868	35.8511	35.6201	34.5351	34.3321	33.3870	33.3870	33.2120	33.7511	34.3321	34.7427	35.1721 (38)
Heat transfer coeff	72.1507	71.9151	71.6841	70.5990	70.3960	69.4510	69.4510	69.2760	69.8150	70.3960	70.8067	71.2360 (39)
Average = Sum(39)m / 12 =												70.5981 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9915	0.9883	0.9851	0.9702	0.9674	0.9544	0.9544	0.9520	0.9594	0.9674	0.9730	0.9789 (40)
HLP (average)												0.9702 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)										Total = Sum(45)m =		1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m	21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (64)
Heat gains from water heating, kWh/month	85.6018	75.9347	80.8908	74.0980	73.7613	67.5576	66.4506	70.7543	69.9517	76.7577	79.1709	84.0770 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5798	16.5024	13.4206	10.1603	7.5949	6.4120	6.9283	9.0057	12.0875	15.3478	17.9132	19.0961 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581 (71)
Water heating gains (Table 5)	115.0562	112.9981	108.7242	102.9139	99.1416	93.8300	89.3153	95.0999	97.1551	103.1690	109.9597	113.0067 (72)
Total internal gains	397.9816	395.9596	383.2780	362.8690	342.2188	322.2725	309.2875	315.0360	325.4989	346.1114	369.7800	387.4618 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W	
West				5.8800	19.6403	0.6300	0.7000	0.7700			35.2936 (80)	
Northwest				7.0700	11.2829	0.6300	0.7000	0.7700			24.3789 (81)	
Solar gains	59.6725	118.6657	203.1086	312.6588	400.5979	418.4572	394.9036	327.0568	241.1834	142.5683	74.6819	48.9328 (83)
Total gains	457.6541	514.6253	586.3866	675.5278	742.8167	740.7297	704.1911	642.0927	566.6823	488.6797	444.4619	436.3946 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	70.0405	70.2700	70.4965	71.5799	71.7863	72.7631	72.7631	72.9469	72.3837	71.7863	71.3700	70.9398
alpha	5.6694	5.6847	5.6998	5.7720	5.7858	5.8509	5.8509	5.8631	5.8256	5.7858	5.7580	5.7293
util living area	0.9974	0.9944	0.9829	0.9322	0.7939	0.5876	0.4321	0.4922	0.7762	0.9657	0.9943	0.9980 (86)
MIT	20.0054	20.1409	20.3839	20.7004	20.9132	20.9876	20.9982	20.9964	20.9441	20.6527	20.2768	19.9860 (87)
Th 2	20.0904	20.0931	20.0958	20.1083	20.1106	20.1215	20.1215	20.1235	20.1173	20.1106	20.1059	20.1009 (88)
util rest of house	0.9966	0.9926	0.9772	0.9107	0.7416	0.5123	0.3468	0.4006	0.7028	0.9505	0.9921	0.9974 (89)
MIT 2	18.7606	18.9600	19.3132	19.7641	20.0301	20.1137	20.1209	20.1221	20.0746	19.7097	19.1685	18.7402 (90)
Living area fraction									fLA = Living area / (4) =			0.3848 (91)
MIT	19.2396	19.4144	19.7252	20.1244	20.3699	20.4500	20.4585	20.4585	20.4091	20.0725	19.5949	19.2195 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2396	19.4144	19.7252	20.1244	20.3699	20.4500	20.4585	20.4585	20.4091	20.0725	19.5949	19.2195 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	455.5995	509.9002	571.3143	615.4939	562.8862	400.7338	267.3910	279.9062	412.9322	464.0786	440.2215	434.8744 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1077.9007	1043.8037	948.0355	792.4307	610.3267	406.2875	267.9740	281.1579	440.4709	666.8277	884.7255	1069.9306 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	462.9920	358.7832	280.2806	127.3945	35.2957	0.0000	0.0000	0.0000	0.0000	150.8453	320.0428	472.4818 (98)
Space heating												2208.1159 (98)
Space heating per m2										(98) / (4) =		30.3438 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2361.6213 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	462.9920	358.7832	280.2806	127.3945	35.2957	0.0000	0.0000	0.0000	0.0000	150.8453	320.0428	472.4818	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	495.1787	383.7253	299.7653	136.2508	37.7494	0.0000	0.0000	0.0000	0.0000	161.3319	342.2918	505.3281	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500	(64)
Efficiency of water heater (217)m	87.0782	86.7714	86.0235	84.2225	81.5766	79.8000	79.8000	79.8000	79.8000	84.5703	86.4087	79.8000	(216)
Fuel for water heating, kWh/month	220.4179	194.9973	206.6499	189.3215	191.6304	175.1642	168.3438	184.5636	184.1870	195.5026	202.1884	214.8980	(219)
Water heating fuel used												2327.8648	(219)
Annual totals kWh/year												2361.6213	(211)
Space heating fuel - main system												0.0000	(215)
Space heating fuel - secondary													
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												328.1242	(232)
Total delivered energy for all uses												5092.6103	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2361.6213	0.2160	510.1102 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2327.8648	0.2160	502.8188 (264)
Space and water heating			1012.9290 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	328.1242	0.5190	170.2965 (268)
Total CO2, kg/m2/year			1222.1505 (272)
Emissions per m2 for space and water heating			13.9196 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3402 (272b)
Emissions per m2 for pumps and fans			0.5349 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.9196 * 1.00) + 2.3402 + 0.5349, rounded to 2 d.p.			16.7900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	119			Issued on Date	29/04/2022
Assessment Reference	119	Prop Type Ref			
Property					
SAP Rating	84 B	DER	15.85	TER	17.23
Environmental	89 B	% DER<TER	7.99		
CO ₂ Emissions (t/year)	0.94	DFEE	40.31	TFEE	45.34
General Requirements Compliance	Pass	% DFEE<TFEE	11.09		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.23 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.85 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)45.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)40.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading: Average
Windows facing North: 5.88 m², No overhang
Windows facing North West: 7.07 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												75.6500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			12.9500	1.1450	14.8282		(27)
External Wall	35.0800	12.9500	22.1300	0.1500	3.3195		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Core	18.2300		18.2300	0.2500	4.5575		(29a)
Total net area of external elements Aum(A, m ²)			70.8100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	28.4977			(33)
Party Wall 1			18.3000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.0220 (36)
Total fabric heat loss							(33) + (36) = 37.5197 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	17.0688	16.8774	16.6860	15.7292	15.5379	14.5811	14.5811	14.3897	14.9638	15.5379	15.9206	16.3033 (38)
Heat transfer coeff	54.5885	54.3972	54.2058	53.2490	53.0576	52.1008	52.1008	51.9094	52.4835	53.0576	53.4403	53.8231 (39)
Average = Sum(39)m / 12 =												53.2011 (39)
HLP	0.7502	0.7475	0.7449	0.7317	0.7291	0.7160	0.7160	0.7133	0.7212	0.7291	0.7344	0.7396 (40)
HLP (average)												0.7311 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy content (annual)	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1401.8427 (45)
	21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1416.0686 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1486.8720 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2052.6825 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2155.3166 (310a)
Electricity used for heat distribution	36.4219 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	169.2357 (330a)
Total electricity for the above, kWh/year	169.2357 (331)
Electricity for lighting (calculated in Appendix L)	322.3944 (332)
Total delivered energy for all uses	4133.8187 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	4069.4845	0.2160	879.0086 (367)
Electrical energy for heat distribution	36.4219	0.5190	18.9030 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			897.9116 (373)
Space and water heating			897.9116 (376)
Pumps and fans	169.2357	0.5190	87.8333 (378)
Energy for lighting	322.3944	0.5190	167.3227 (379)
Total CO2, kg/year			1153.0676 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.8500 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		15.8500 ZC1
Total Floor Area	TFA	72.7700
Assumed number of occupants	N	2.3115
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.5855 ZC2
CO2 emissions from cooking, equation (L16)		2.3976 ZC3
Total CO2 emissions		34.8331 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		34.8331 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 30.0000 / (5) = 0.1649 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4149 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3527 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4497	0.4408	0.4320	0.3879	0.3791	0.3350	0.3350	0.3262	0.3527	0.3791	0.3968	0.4144 (22b)
Effective ac	0.6011	0.5972	0.5933	0.5752	0.5719	0.5561	0.5561	0.5532	0.5622	0.5719	0.5787	0.5859 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			12.9500	1.3258	17.1686		(27)
External Wall	35.0800	12.9500	22.1300	0.1800	3.9834		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Core	18.2300		18.2300	0.1800	3.2814		(29a)
Total net area of external elements Aum(A, m ²)			70.8100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.1332		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.9308 (36)
Total fabric heat loss						(33) + (36) =	36.0640 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.0868	35.8511	35.6201	34.5351	34.3321	33.3870	33.3870	33.2120	33.7511	34.3321	34.7427	35.1721 (38)
Heat transfer coeff												
Average = Sum(39)m / 12 =	72.1507	71.9151	71.6841	70.5990	70.3960	69.4510	69.4510	69.2760	69.8150	70.3960	70.8067	71.2360 (39)
												70.5981 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9915	0.9883	0.9851	0.9702	0.9674	0.9544	0.9544	0.9520	0.9594	0.9674	0.9730	0.9789 (40)
HLP (average)												0.9702 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)												Total = Sum(45)m = 1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m	21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

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Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (64)
Heat gains from water heating, kWh/month	85.6018	75.9347	80.8908	74.0980	73.7613	67.5576	66.4506	70.7543	69.9517	76.7577	79.1709	84.0770 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5798	16.5024	13.4206	10.1603	7.5949	6.4120	6.9283	9.0057	12.0875	15.3478	17.9132	19.0961 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581 (71)
Water heating gains (Table 5)	115.0562	112.9981	108.7242	102.9139	99.1416	93.8300	89.3153	95.0999	97.1551	103.1690	109.9597	113.0067 (72)
Total internal gains	397.9816	395.9596	383.2780	362.8690	342.2188	322.2725	309.2875	315.0360	325.4989	346.1114	369.7800	387.4618 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
North					5.8800	10.6334	0.6300	0.7000			0.7700	19.1083 (74)
Northwest					7.0700	11.2829	0.6300	0.7000			0.7700	24.3789 (81)
Solar gains	43.4871	86.1407	151.4575	246.5010	331.6343	354.1512	331.0351	263.3898	183.5487	104.1129	54.2474	35.8386 (83)
Total gains	441.4687	482.1003	534.7355	609.3700	673.8531	676.4237	640.3226	578.4258	509.0476	450.2243	424.0274	423.3004 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	70.0405	70.2700	70.4965	71.5799	71.7863	72.7631	72.7631	72.9469	72.3837	71.7863	71.3700	70.9398
alpha	5.6694	5.6847	5.6998	5.7720	5.7858	5.8509	5.8509	5.8631	5.8256	5.7858	5.7580	5.7293
util living area	0.9979	0.9960	0.9889	0.9546	0.8401	0.6366	0.4739	0.5433	0.8289	0.9760	0.9955	0.9983 (86)
MIT	19.9842	20.0989	20.3206	20.6363	20.8817	20.9815	20.9972	20.9941	20.9201	20.6092	20.2504	19.9687 (87)
Th 2	20.0904	20.0931	20.0958	20.1083	20.1106	20.1215	20.1215	20.1235	20.1173	20.1106	20.1059	20.1009 (88)
util rest of house	0.9972	0.9946	0.9850	0.9386	0.7923	0.5579	0.3811	0.4438	0.7608	0.9646	0.9938	0.9978 (89)
MIT 2	18.7297	18.8990	19.2229	19.6797	19.9969	20.1095	20.1205	20.1211	20.0530	19.6507	19.1302	18.7150 (90)
Living area fraction									fLA = Living area / (4) =			0.3846 (91)
MIT	19.2122	19.3605	19.6451	20.0476	20.3372	20.4449	20.4577	20.4569	20.3865	20.0194	19.5611	19.1972 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2122	19.3605	19.6451	20.0476	20.3372	20.4449	20.4577	20.4569	20.3865	20.0194	19.5611	19.1972 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9962	0.9932	0.9825	0.9374	0.8055	0.5876	0.4169	0.4822	0.7835	0.9632	0.9923	0.9970 (94)
Useful gains	439.7965	478.8098	525.3686	571.2020	542.7729	397.4964	266.9643	278.9298	398.8394	433.6394	420.7646	422.0274 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1075.9275	1039.9304	942.2962	787.0130	608.0255	405.9340	267.9188	281.0432	438.8945	663.0880	882.3280	1068.3425 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	473.2814	377.0731	310.1941	155.3839	48.5479	0.0000	0.0000	0.0000	0.0000	170.7098	332.3257	480.8585 (98)
Space heating												2348.3743 (98)
Space heating per m2										(98) / (4) =		32.2712 (99)

8c. Space cooling requirement

Not applicable

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9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2511.6303 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	473.2814	377.0731	310.1941	155.3839	48.5479	0.0000	0.0000	0.0000	0.0000	170.7098	332.3257	480.8585	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	506.1833	403.2867	331.7584	166.1860	51.9229	0.0000	0.0000	0.0000	0.0000	182.5773	355.4285	514.2871	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500	(64)
Efficiency of water heater (217)m	87.1292	86.8913	86.2851	84.7451	82.1002	79.8000	79.8000	79.8000	79.8000	84.8991	86.5034	79.8000	(216)
Fuel for water heating, kWh/month	220.2890	194.7283	206.0233	188.1540	190.4082	175.1642	168.3438	184.5636	184.1870	194.7454	201.9670	214.7992	(219)
Water heating fuel used												2323.3731	(219)
Annual totals kWh/year													
Space heating fuel - main system												2511.6303	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												328.1242	(232)
Total delivered energy for all uses												5238.1276	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2511.6303	0.2160	542.5121 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2323.3731	0.2160	501.8486 (264)
Space and water heating			1044.3607 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	328.1242	0.5190	170.2965 (268)
Total CO2, kg/m2/year			1253.5822 (272)
Emissions per m2 for space and water heating			14.3515 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3402 (272b)
Emissions per m2 for pumps and fans			0.5349 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.3515 * 1.00) + 2.3402 + 0.5349, rounded to 2 d.p.			17.2300 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	120	Issued on Date	29/04/2022
Assessment Reference	120	Prop Type Ref	
Property			
SAP Rating	85 B	DER	14.30
Environmental	89 B	TER	15.89
CO ₂ Emissions (t/year)	0.89	% DER<TER	10.01
General Requirements Compliance	Fail	DFEE	33.90
		TFEE	39.71
		% DFEE<TFEE	14.62
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 74 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 15.89 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.30 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)39.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)33.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing North: 1.97 m², No overhang
Windows facing North East: 6.47 m², No overhang
Windows facing East: 2.21 m², No overhang
Windows facing South East: 6.24 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

					main	secondary	other			total	m3 per hour		
					heating		heating						
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)	
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)	
Number of intermittent fans											0 * 10 =	0.0000 (7a)	
Number of passive vents											0 * 10 =	0.0000 (7b)	
Number of flueless gas fires											0 * 40 =	0.0000 (7c)	
											Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											0.0000 / (5) =		0.0000 (8)
Pressure test											Yes		
Measured/design AP50													3.0000
Infiltration rate													0.1500 (18)
Number of sides sheltered													2 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =		0.1275 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)	
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)	
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)	
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation:													0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													75.6500 (23c)
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)	

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			16.8900	1.1450	19.3397		(27)					
External Wall	49.6500	16.8900	32.7600	0.1500	4.9140		(29a)					
Corridor	4.5800	1.8900	2.6900	0.2500	0.6725		(29a)					
Total net area of external elements Aum(A, m2)			54.2300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	26.8162		(33)					
Party Wall 1			38.0500	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.6120 (36)					
Total fabric heat loss							(33) + (36) = 35.4282 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 17.2447	Feb 17.0514	Mar 16.8580	Apr 15.8913	May 15.6980	Jun 14.7313	Jul 14.7313	Aug 14.5380	Sep 15.1180	Oct 15.6980	Nov 16.0847	Dec 16.4714 (38)
Heat transfer coeff	52.6729	52.4796	52.2862	51.3195	51.1262	50.1595	50.1595	49.9662	50.5462	51.1262	51.5129	51.8995 (39)
Average = Sum(39)m / 12 =												51.2712 (39)
HLP	Jan 0.7164	Feb 0.7138	Mar 0.7112	Apr 0.6980	May 0.6954	Jun 0.6823	Jul 0.6823	Aug 0.6796	Sep 0.6875	Oct 0.6954	Nov 0.7007	Dec 0.7059 (40)
HLP (average)												0.6974 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	Jan 98.4511	Feb 94.8710	Mar 91.2910	Apr 87.7110	May 84.1309	Jun 80.5509	Jul 80.5509	Aug 84.1309	Sep 87.7110	Oct 91.2910	Nov 94.8710	Dec 98.4511 (44)
Energy conte	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Energy content (annual)										Total = Sum(45)m =		1408.1991 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (56)													
If cylinder contains dedicated solar storage													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (57)													
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month													
201.2769 177.6201 187.0442 168.3717 165.5050 148.6122 143.4181 156.4202 155.8451 174.5575 183.6979 196.6701 196.6701 (62)													
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
201.2769 177.6201 187.0442 168.3717 165.5050 148.6122 143.4181 156.4202 155.8451 174.5575 183.6979 196.6701 196.6701 (64)													
Total per year (kWh/year) = Sum(64)m =													2059.0388 (64)
Heat gains from water heating, kWh/month													
92.7665 82.3997 88.0341 80.9919 80.8723 74.4219 73.5284 77.8516 76.8268 83.8823 86.0878 91.2347 91.2347 (65)													

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)													
(66)m 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 (66)													
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
18.3088 16.2617 13.2249 10.0121 7.4842 6.3185 6.8273 8.8744 11.9112 15.1240 17.6520 18.8177 18.8177 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
205.3693 207.5004 202.1301 190.6974 176.2657 162.7019 153.6405 151.5094 156.8797 168.3123 182.7441 196.3078 196.3078 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 (69)													
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													
-93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 (71)													
Water heating gains (Table 5)													
124.6861 122.6187 118.3254 112.4887 108.6993 103.3637 98.8285 104.6393 106.7039 112.7450 119.5664 122.6273 122.6273 (72)													
Total internal gains													
406.2912 404.3077 391.6074 371.1252 350.3761 330.3110 317.2233 322.9500 333.4217 354.1083 377.8894 395.6798 395.6798 (73)													

6. Solar gains

[Jan]													
Area m2													
Solar flux Table 6a W/m2													
Specific data or Table 6b													
Specific data or Table 6c													
Access factor Table 6d													
Gains W													
North 1.9700 10.6334 0.4000 0.8000 0.7700 4.6454 (74)													
Northeast 6.4700 11.2829 0.4000 0.8000 0.7700 16.1886 (75)													
East 2.2100 19.6403 0.4000 0.8000 0.7700 9.6255 (76)													
Southeast 6.2400 36.7938 0.4000 0.8000 0.7700 50.9147 (77)													
Solar gains	81.3741	147.3860	224.1274	313.9875	383.8134	394.9010	374.9771	320.9403	255.0324	169.0321	99.0860	68.5809	68.5809 (83)
Total gains	487.6653	551.6937	615.7347	685.1127	734.1896	725.2120	692.2003	643.8903	588.4541	523.1404	476.9754	464.2607	464.2607 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)													
tau 96.9295 97.2866 97.6463 99.4856 99.8618 101.7863 101.7863 102.1802 101.0077 99.8618 99.1122 98.3738 98.3738 (86)													
alpha 7.4620 7.4858 7.5098 7.6324 7.6575 7.7858 7.7858 7.8120 7.7338 7.6575 7.6075 7.5583 7.5583 (86)													
util living area 0.9945 0.9853 0.9525 0.8363 0.6392 0.4422 0.3188 0.3569 0.5884 0.8915 0.9843 0.9960 0.9960 (86)													
MIT 20.4526 20.5819 20.7617 20.9332 20.9914 20.9996 21.0000 20.9999 20.9965 20.9090 20.6570 20.4308 20.4308 (87)													
Th 2 20.3263 20.3286 20.3310 20.3426 20.3449 20.3565 20.3565 20.3589 20.3519 20.3449 20.3402 20.3356 20.3356 (88)													
util rest of house 0.9929 0.9812 0.9404 0.8058 0.5970 0.3980 0.2722 0.3072 0.5350 0.8618 0.9793 0.9948 0.9948 (89)													
MIT 2 19.5951 19.7833 20.0379 20.2709 20.3374 20.3563 20.3565 20.3588 20.3494 20.2482 19.9022 19.5711 19.5711 (90)													
Living area fraction fLA = Living area / (4) = 0.3678 (91)													
MIT 19.9105 20.0770 20.3041 20.5145 20.5780 20.5929 20.5932 20.5946 20.5874 20.4913 20.1798 19.8873 19.8873 (92)													
Temperature adjustment 0.0000													
adjusted MIT 19.9105 20.0770 20.3041 20.5145 20.5780 20.5929 20.5932 20.5946 20.5874 20.4913 20.1798 19.8873 19.8873 (93)													

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.9916 0.9794 0.9399 0.8141 0.6122 0.4142 0.2893 0.3255 0.5545 0.8689 0.9778 0.9938 0.9938 (94)													
Useful gains	483.5925	540.3385	578.7309	557.7796	449.4678	300.4138	200.2868	209.5675	326.3272	454.5820	466.3702	461.3785	461.3785 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	4.2000 (96)
Heat loss rate W													
822.2507 796.4811 721.7657 596.0497 453.8968 300.5991 200.2959 209.5895 327.9140 505.7030 673.7790 814.1629 814.1629 (97)													
Month fracti 1.0000 1.0000 1.0000 1.0000 1.0000 0.0000 0.0000 0.0000 0.0000 1.0000 1.0000 1.0000 1.0000 (97a)													
Space heating kWh													
251.9617 172.1278 106.4179 27.5545 3.2951 0.0000 0.0000 0.0000 0.0000 38.0340 149.3344 262.4716 262.4716 (98)													
Space heating													
Space heating per m2													
													1011.1969 (98)
													(98) / (4) = 13.7540 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1011.1969 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1061.7568 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating:	
Annual water heating requirement	2059.0388 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2161.9908 (310a)
Electricity used for heat distribution	32.2375 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	170.9800 (330a)
Total electricity for the above, kWh/year	170.9800 (331)
Electricity for lighting (calculated in Appendix L)	323.3395 (332)
Total delivered energy for all uses	3718.0670 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3601.9526	0.2160	778.0218 (367)
Electrical energy for heat distribution	32.2375	0.5190	16.7312 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			794.7530 (373)
Space and water heating			794.7530 (376)
Pumps and fans	170.9800	0.5190	88.7386 (378)
Energy for lighting	323.3395	0.5190	167.8132 (379)
Total CO2, kg/year			1051.3048 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.3000 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		14.3000 ZC1
Total Floor Area	TFA	73.5200
Assumed number of occupants	N	2.3285
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.5530 ZC2
CO2 emissions from cooking, equation (L16)		2.3787 ZC3
Total CO2 emissions		33.2317 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		33.2317 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1632 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4132 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3512 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4478	0.4390	0.4303	0.3864	0.3776	0.3337	0.3337	0.3249	0.3512	0.3776	0.3951	0.4127 (22b)
	0.6003	0.5964	0.5926	0.5746	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			16.4900	1.3258	21.8617			(27)					
External Wall	49.6500	16.4900	33.1600	0.1800	5.9688			(29a)					
Corridor	4.5800	1.8900	2.6900	0.1800	0.4842			(29a)					
Total net area of external elements Aum(A, m2)			54.2300					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.2047			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								6.5566 (36)					
Total fabric heat loss						(33) + (36) =		36.7613 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 36.4091	Feb 36.1729	Mar 35.9414	Apr 34.8541	May 34.6506	Jun 33.7036	Jul 33.7036	Aug 33.5282	Sep 34.0684	Oct 34.6506	Nov 35.0622	Dec 35.4924	(38)
Heat transfer coeff	73.1704	72.9342	72.7028	71.6154	71.4120	70.4649	70.4649	70.2896	70.8297	71.4120	71.8235	72.2538	(39)
Average = Sum(39)m / 12 =												71.6144	(39)
HLP	Jan 0.9952	Feb 0.9920	Mar 0.9889	Apr 0.9741	May 0.9713	Jun 0.9584	Jul 0.9584	Aug 0.9561	Sep 0.9634	Oct 0.9713	Nov 0.9769	Dec 0.9828	(40)
HLP (average)												0.9741	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy conte	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Energy content (annual)										Total = Sum(45)m =		1408.1991 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
	85.8210	76.1264	81.0886	74.2704	73.9268	67.7004	66.5829	70.9061	70.1053	76.9367	79.3664	84.2892 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3070	16.2601	13.2236	10.0111	7.4834	6.3178	6.8266	8.8735	11.9100	15.1225	17.6502	18.8158	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	(71)
Water heating gains (Table 5)	115.3508	113.2833	108.9900	103.1533	99.3640	94.0283	89.4931	95.3039	97.3685	103.4096	110.2311	113.2919	(72)
Total internal gains	399.9539	397.9707	385.2706	364.7888	344.0400	323.9750	310.8872	316.6137	327.0851	347.7714	371.5522	389.3425	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				1.9200	10.6334	0.6300		0.7000		0.7700		6.2394 (74)
Northeast				6.3200	11.2829	0.6300		0.7000		0.7700		21.7927 (75)
East				2.1600	19.6403	0.6300		0.7000		0.7700		12.9650 (76)
Southeast				6.0900	36.7938	0.6300		0.7000		0.7700		68.4801 (77)
Solar gains	109.4772	198.2928	301.5531	422.4704	516.4299	531.3511	504.5419	431.8290	343.1398	227.4190	133.3072	92.2650 (83)
Total gains	509.4312	596.2635	686.8237	787.2591	860.4699	855.3261	815.4291	748.4428	670.2249	575.1904	504.8594	481.6075 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.7762	70.0022	70.2251	71.2913	71.4944	72.4553	72.4553	72.6360	72.0821	71.4944	71.0847	70.6614	
alpha	5.6517	5.6668	5.6817	5.7528	5.7663	5.8304	5.8304	5.8424	5.8055	5.7663	5.7390	5.7108	
util living area	0.9958	0.9893	0.9676	0.8895	0.7240	0.5212	0.3794	0.4302	0.6935	0.9372	0.9900	0.9969	(86)
MIT	20.0606	20.2314	20.4872	20.7806	20.9456	20.9932	20.9991	20.9982	20.9683	20.7311	20.3424	20.0333	(87)
Th 2	20.0873	20.0900	20.0926	20.1050	20.1073	20.1181	20.1181	20.1201	20.1139	20.1073	20.1026	20.0977	(88)
util rest of house	0.9945	0.9860	0.9577	0.8599	0.6687	0.4521	0.3038	0.3489	0.6181	0.9129	0.9863	0.9959	(89)
MIT 2	18.8387	19.0883	19.4556	19.8625	20.0590	20.1139	20.1178	20.1194	20.0913	19.8098	19.2604	18.8067	(90)
Living area fraction	19.2881	19.5087	19.8351	20.2001	20.3851	20.4373	20.4419	20.4426	20.4138	20.1487	19.6584	19.2578	(91)
MIT	19.2881	19.5087	19.8351	20.2001	20.3851	20.4373	20.4419	20.4426	20.4138	20.1487	19.6584	19.2578	(92)
Temperature adjustment	19.2881	19.5087	19.8351	20.2001	20.3851	20.4373	20.4419	20.4426	20.4138	20.1487	19.6584	19.2578	(93)
adjusted MIT	19.2881	19.5087	19.8351	20.2001	20.3851	20.4373	20.4419	20.4426	20.4138	20.1487	19.6584	19.2578	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9929	0.9832	0.9543	0.8634	0.6866	0.4774	0.3316	0.3788	0.6446	0.9142	0.9839	0.9947	(94)
Ext temp.	505.8298	586.2685	655.4357	679.7154	590.7937	408.3150	270.4286	283.5377	432.0324	525.8519	496.7444	479.0404	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1096.6878	1065.4774	969.4949	809.2647	620.2208	411.3255	270.7207	284.1534	447.2074	681.8883	901.9874	1087.9829	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	439.5984	322.0284	233.6600	93.2755	21.8938	0.0000	0.0000	0.0000	0.0000	116.0911	291.7749	453.0532	(98)
Space heating per m2												1971.3753	(98)
												26.8141	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2108.4228 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	439.5984	322.0284	233.6600	93.2755	21.8938	0.0000	0.0000	0.0000	0.0000	116.0911	291.7749	453.0532	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	470.1587	344.4154	249.9038	99.7599	23.4158	0.0000	0.0000	0.0000	0.0000	124.1616	312.0588	484.5489	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882	(64)
Efficiency of water heater (217)m	86.9483	86.4963	85.5351	83.4333	80.9728	79.8000	79.8000	79.8000	79.8000	83.8833	86.1639	87.0761	(216)
Fuel for water heating, kWh/month	221.5052	196.2840	208.5252	191.7338	193.6737	175.7022	168.8423	185.1357	184.7660	197.7456	203.4448	215.8896	(219)
Water heating fuel used												2343.2482	(219)
Annual totals kWh/year													
Space heating fuel - main system												2108.4228	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												323.3067	(232)
Total delivered energy for all uses												4849.9778	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2108.4228	0.2160	455.4193 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2343.2482	0.2160	506.1416 (264)
Space and water heating			961.5609 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	323.3067	0.5190	167.7962 (268)
Total CO2, kg/m2/year			1168.2821 (272)
Emissions per m2 for space and water heating			13.0789 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2823 (272b)
Emissions per m2 for pumps and fans			0.5294 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.0789 * 1.00) + 2.2823 + 0.5294, rounded to 2 d.p.			15.8900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	121	Issued on Date	29/04/2022
Assessment Reference	121	Prop Type Ref	
Property			
SAP Rating	84 B	DER	15.04
Environmental	90 B	TER	16.44
CO ₂ Emissions (t/year)	0.69	% DER<TER	8.51
General Requirements Compliance	Fail	DFEE	28.59
		TFEE	30.75
		% DFEE<TFEE	7.05
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.44 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.04 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)30.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)28.6 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing South East: 6.24 m², No overhang
Windows facing South: 2.21 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating		secondary heating		other		total		m3 per hour			
Number of chimneys	0	+	0	+	0	=	0 * 40 =		0.0000 (6a)			
Number of open flues	0	+	0	+	0	=	0 * 20 =		0.0000 (6b)			
Number of intermittent fans							0 * 10 =		0.0000 (7a)			
Number of passive vents							0 * 10 =		0.0000 (7b)			
Number of flueless gas fires							0 * 40 =		0.0000 (7c)			
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =		0.0000 (8)			
Pressure test									Yes			
Measured/design AP50									3.0000			
Infiltration rate									0.1500 (18)			
Number of sides sheltered									3 (19)			
Shelter factor							(20) = 1 - [0.075 x (19)] =		0.7750 (20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =		0.1163 (21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)					
External Wall	19.8500	8.4500	11.4000	0.1500	1.7100		(29a)					
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)					
Total net area of external elements Aum(A, m2)			37.3500				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		17.1781		(33)					
Party Wall 1			37.0000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.3010 (36)					
Total fabric heat loss							(33) + (36) = 22.4791 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 11.1341	Feb 11.0123	Mar 10.8905	Apr 10.2816	May 10.1599	Jun 9.5510	Jul 9.5510	Aug 9.4292	Sep 9.7945	Oct 10.1599	Nov 10.4034	Dec 10.6470 (38)
Heat transfer coeff	33.6132	33.4914	33.3696	32.7607	32.6389	32.0301	32.0301	31.9083	32.2736	32.6389	32.8825	33.1260 (39)
Average = Sum(39)m / 12 =	32.7303 (39)											
HLP	Jan 0.6618	Feb 0.6594	Mar 0.6570	Apr 0.6450	May 0.6426	Jun 0.6306	Jul 0.6306	Aug 0.6282	Sep 0.6354	Oct 0.6426	Nov 0.6474	Dec 0.6522 (40)
HLP (average)	0.6444 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan 82.3820	Feb 79.3863	Mar 76.3906	Apr 73.3949	May 70.3992	Jun 67.4035	Jul 67.4035	Aug 70.3992	Sep 73.3949	Oct 76.3906	Nov 79.3863	Dec 82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												

store volume													110.0000	(47)	
b) If manufacturer declared loss factor is not known :															
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152	(51)	
Volume factor from Table 2a													1.0294	(52)	
Temperature factor from Table 2b													0.6000	(53)	
Enter (49) or (54) in (55)													1.0327	(55)	
Total storage loss															
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	30.9817	32.0144	(56)	
If cylinder contains dedicated solar storage															
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	30.9817	32.0144	(57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month															
177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	62)			
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)	
Solar input															
Output from w/h															
177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	64)			
Heat gains from water heating, kWh/month															
84.8430	75.4698	80.8830	74.7574	74.8902	69.2597	68.7450	72.3625	71.2721	77.4089	79.0216	83.5613	65)			

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.4839	11.9763	9.7398	7.3736	5.5119	4.6534	5.0281	6.5357	8.7723	11.1384	13.0002	13.8587 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	114.0363	112.3063	108.7138	103.8297	100.6589	96.1941	92.3992	97.2615	98.9891	104.0442	109.7522	112.3135 (72)
Total internal gains	325.5065	323.8179	314.0852	298.5244	283.0012	267.8182	257.8112	262.6320	270.4999	286.2317	304.2921	317.5716 (73)

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Southeast				6.2400	36.7938		0.4000		0.8000		0.7700		50.9147
South				2.2100	46.7521		0.4000		0.8000		0.7700		22.9127 (77)
Solar gains	73.8274	124.2516	166.4633	201.0539	220.9821	217.6723	210.5612	195.8614	178.4200	136.3256	88.1434		63.3710 (83)
Total gains	399.3338	448.0695	480.5485	499.5783	503.9832	485.4906	468.3724	458.4934	448.9198	422.5573	392.4355		380.9426 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	104.9316	105.3132	105.6975	107.6620	108.0637	110.1179	110.1179	110.5382	109.2869	108.0637	107.2633	106.4746
alpha	7.9954	8.0209	8.0465	8.1775	8.2042	8.3412	8.3412	8.3692	8.2858	8.2042	8.1509	8.0983
util living area												
	0.9801	0.9528	0.8925	0.7654	0.5985	0.4221	0.3009	0.3201	0.4953	0.7731	0.9457	0.9849 (86)
MIT	20.6551	20.7720	20.8883	20.9714	20.9961	20.9998	21.0000	21.0000	20.9993	20.9740	20.8251	20.6313 (87)
Th 2	20.3747	20.3768	20.3790	20.3896	20.3918	20.4025	20.4025	20.4047	20.3982	20.3918	20.3875	20.3832 (88)
util rest of house												
	0.9751	0.9424	0.8724	0.7336	0.5607	0.3827	0.2600	0.2787	0.4524	0.7361	0.9322	0.9810 (89)
MIT 2	19.9260	20.0911	20.2483	20.3601	20.3885	20.4024	20.4025	20.4046	20.3977	20.3663	20.1755	19.8996 (90)
Living area fraction									fLA = Living area / (4) =			0.5029 (91)
MIT	20.2926	20.4335	20.5701	20.6675	20.6940	20.7028	20.7030	20.7040	20.7002	20.6719	20.5022	20.2675 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2926	20.4335	20.5701	20.6675	20.6940	20.7028	20.7030	20.7040	20.7002	20.6719	20.5022	20.2675 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9744	0.9434	0.8789	0.7484	0.5796	0.4025	0.2806	0.2995	0.4740	0.7535	0.9349	0.9801 (94)
Useful gains	389.0916	422.7160	422.3306	373.8624	292.0911	195.4142	131.4154	137.3297	212.7811	318.4072	366.9047	373.3658 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
	537.5630	520.2378	469.5140	385.5124	293.5554	195.4733	131.4178	137.3337	213.0138	328.7359	440.6970	532.2525 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
	110.4627	65.5347	35.1045	8.3880	1.0895	0.0000	0.0000	0.0000	0.0000	7.6845	53.1304	118.2117 (98)
Space heating												399.6060 (98)
Space heating per m2												7.8678 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	399.6060	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	419.5863	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1829.1942	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1920.6539	(310a)
Electricity used for heat distribution	23.4024	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	121.9912	(330a)
Total electricity for the above, kWh/year	121.9912	(331)
Electricity for lighting (calculated in Appendix L)	238.1302	(332)
Total delivered energy for all uses	2700.3616	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	2614.7935	0.2160	564.7954 (367)
Electrical energy for heat distribution	23.4024	0.5190	12.1458 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			576.9412 (373)
Space and water heating			576.9412 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	238.1302	0.5190	123.5896 (379)
Total CO2, kg/year			763.8443 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.0400 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER	15.0400	ZC1
Total Floor Area	50.7900	TFA
Assumed number of occupants	1.7134	N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	EF
CO2 emissions from appliances, equation (L14)	17.4175	ZC2
CO2 emissions from cooking, equation (L16)	3.1526	ZC3
Total CO2 emissions	35.6101	ZC4
Residual CO2 emissions offset from biofuel CHP	0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year	0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000	ZC7
Net CO2 emissions	35.6101	ZC8

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					20.0000 / (5) = 0.1575 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4075 (18)
					3 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)					
External Wall	19.8500	8.4500	11.4000	0.1800	2.0520		(29a)					
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)					
Total net area of external elements Aum(A, m2)			37.3500				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	17.9545		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.9726 (36)					
Total fabric heat loss						(33) + (36) =	21.9271 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 24.3480	Feb 24.2160	Mar 24.0867	Apr 23.4794	May 23.3658	Jun 22.8368	Jul 22.8368	Aug 22.7389	Sep 23.0406	Oct 23.3658	Nov 23.5957	Dec 23.8360 (38)
Heat transfer coeff	46.2750	46.1431	46.0138	45.4065	45.2928	44.7639	44.7639	44.6659	44.9676	45.2928	45.5227	45.7630 (39)
Average = Sum(39)m / 12 =												45.4059 (39)
HLP	Jan 0.9111	Feb 0.9085	Mar 0.9060	Apr 0.8940	May 0.8918	Jun 0.8814	Jul 0.8814	Aug 0.8794	Sep 0.8854	Oct 0.8918	Nov 0.8963	Dec 0.9010 (40)
HLP (average)												0.8940 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan 82.3820	Feb 79.3863	Mar 76.3906	Apr 73.3949	May 70.3992	Jun 67.4035	Jul 67.4035	Aug 70.3992	Sep 73.3949	Oct 76.3906	Nov 79.3863	Dec 82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

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If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W	
Southeast				6.2400	36.7938	0.6300		0.7000		0.7700	70.1668 (77)	
South				2.2100	46.7521	0.6300		0.7000		0.7700	31.5766 (78)	

Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains	421.2115	488.9806	537.3716	569.4289	581.3281	561.5651	541.7662	526.3621	510.2428	468.0154	419.7157	398.8747 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.2201	76.4380	76.6527	77.6780	77.8729	78.7931	78.7931	78.9659	78.4360	77.8729	77.4796	77.0728	
alpha	6.0813	6.0959	6.1102	6.1785	6.1915	6.2529	6.2529	6.2644	6.2291	6.1915	6.1653	6.1382	
util living area	0.9885	0.9719	0.9340	0.8448	0.6945	0.5064	0.3631	0.3897	0.5970	0.8637	0.9717	0.9913	(86)
MIT	20.3109	20.4822	20.6801	20.8674	20.9660	20.9959	20.9996	20.9993	20.9890	20.8704	20.5639	20.2768	(87)
Th 2	20.1581	20.1603	20.1624	20.1726	20.1745	20.1834	20.1834	20.1850	20.1800	20.1745	20.1707	20.1666	(88)
util rest of house	0.9851	0.9642	0.9172	0.8109	0.6422	0.4435	0.2960	0.3210	0.5307	0.8261	0.9627	0.9888	(89)
MIT 2	19.2552	19.5011	19.7776	20.0303	20.1446	20.1809	20.1832	20.1848	20.1725	20.0408	19.6284	19.2126	(90)
Living area fraction	19.7861	19.9945	20.2314	20.4513	20.5577	20.5907	20.5937	20.5944	20.5831	20.4580	20.0989	19.7477	(92)
Temperature adjustment	19.7861	19.9945	20.2314	20.4513	20.5577	20.5907	20.5937	20.5944	20.5831	20.4580	20.0989	19.7477	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	414.1915	470.6274	493.6920	468.6178	387.7457	266.7830	178.6577	187.1586	287.6369	393.0783	403.6675	393.7705	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	716.6180	696.5067	631.8341	524.5023	401.1892	268.1678	178.7745	187.3454	291.5290	446.4946	591.7431	711.5114	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	225.0053	151.7909	102.7777	40.2368	10.0020	0.0000	0.0000	0.0000	0.0000	39.7417	135.4144	236.3992	(98)
Space heating												941.3681	(98)
Space heating per m2												18.5345	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1006.8108 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	225.0053	151.7909	102.7777	40.2368	10.0020	0.0000	0.0000	0.0000	0.0000	39.7417	135.4144	236.3992	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	240.6474	162.3432	109.9227	43.0340	10.6973	0.0000	0.0000	0.0000	0.0000	42.5045	144.8282	252.8334	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	85.5818	84.8645	83.7183	81.9485	80.4391	79.8000	79.8000	79.8000	79.8000	81.8665	84.4723	85.7739	(216)
Fuel for water heating, kWh/month	197.1972	175.4993	187.3609	172.3273	172.5923	156.2471	150.8144	164.4484	163.8315	178.8360	182.3607	192.2615	(219)
Water heating fuel used												2093.7767	(219)
Annual totals kWh/year													
Space heating fuel - main system												1006.8108	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												3418.9638	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1006.8108	0.2160	217.4711 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2093.7767	0.2160	452.2558 (264)
Space and water heating			669.7269 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			834.9642 (272)
Emissions per m2 for space and water heating			13.1862 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.1862 * 1.00) + 2.4870 + 0.7664, rounded to 2 d.p.			16.4400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	122	Issued on Date	29/04/2022
Assessment Reference	122	Prop Type Ref	
Property			
SAP Rating	84 B	DER	15.22
Environmental	90 B	TER	16.64
CO ₂ Emissions (t/year)	0.69	% DER<TER	8.52
General Requirements Compliance	Fail	DFEE	29.45
		TFEE	31.81
		% DFEE<TFEE	7.41
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.64 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.22 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)31.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)29.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing South East: 6.24 m², No overhang
Windows facing South: 2.21 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

					main	secondary	other			total	m3 per hour	
					heating		heating					
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
											Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =										0.0000 / (5) =		0.0000 (8)
Pressure test										Yes		
Measured/design AP50										3.0000		
Infiltration rate										0.1500		(18)
Number of sides sheltered										3		(19)
Shelter factor										(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =		0.1163 (21)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)					
External Wall	23.1000	8.4500	14.6500	0.1500	2.1975		(29a)					
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)					
Total net area of external elements Aum(A, m2)				40.6000			(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	17.6656		(33)					
Party Wall 1			33.8800	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.5610 (36)					
Total fabric heat loss							(33) + (36) = 23.2266 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 11.1341	Feb 11.0123	Mar 10.8905	Apr 10.2816	May 10.1599	Jun 9.5510	Jul 9.5510	Aug 9.4292	Sep 9.7945	Oct 10.1599	Nov 10.4034	Dec 10.6470 (38)
Heat transfer coeff	34.3607	34.2389	34.1171	33.5082	33.3864	32.7776	32.7776	32.6558	33.0211	33.3864	33.6300	33.8735 (39)
Average = Sum(39)m / 12 =	33.4778 (39)											
HLP	Jan 0.6765	Feb 0.6741	Mar 0.6717	Apr 0.6597	May 0.6573	Jun 0.6454	Jul 0.6454	Aug 0.6430	Sep 0.6501	Oct 0.6573	Nov 0.6621	Dec 0.6669 (40)
HLP (average)	0.6591 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan 82.3820	Feb 79.3863	Mar 76.3906	Apr 73.3949	May 70.3992	Jun 67.4035	Jul 67.4035	Aug 70.3992	Sep 73.3949	Oct 76.3906	Nov 79.3863	Dec 82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (56)													
If cylinder contains dedicated solar storage													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (57)													
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month													
177.4469 156.7782 165.5372 149.6214 147.5136 133.0871 129.0318 139.9117 139.1394 155.0886 162.4461 173.5921 173.5921 (62)													
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
177.4469 156.7782 165.5372 149.6214 147.5136 133.0871 129.0318 139.9117 139.1394 155.0886 162.4461 173.5921 173.5921 (64)													
Total per year (kWh/year) = Sum(64)m =													1829.1942 (64)
Heat gains from water heating, kWh/month													
84.8430 75.4698 80.8830 74.7574 74.8902 69.2597 68.7450 72.3625 71.2721 77.4089 79.0216 83.5613 83.5613 (65)													

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
13.4839 11.9763 9.7398 7.3736 5.5119 4.6534 5.0281 6.5357 8.7723 11.1384 13.0002 13.8587 13.8587 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
149.2855 150.8347 146.9309 138.6204 128.1298 118.2701 111.6832 110.1341 114.0378 122.3484 132.8390 142.6987 142.6987 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 (69)													
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													
-68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 (71)													
Water heating gains (Table 5)													
114.0363 112.3063 108.7138 103.8297 100.6589 96.1941 92.3992 97.2615 98.9891 104.0442 109.7522 112.3135 112.3135 (72)													
Total internal gains	325.5065	323.8179	314.0852	298.5244	283.0012	267.8182	257.8112	262.6320	270.4999	286.2317	304.2921	317.5716	317.5716 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W	
Southeast					6.2400	36.7938	0.4000	0.8000			0.7700	50.9147 (77)	
South					2.2100	46.7521	0.4000	0.8000			0.7700	22.9127 (78)	

Solar gains	73.8274	124.2516	166.4633	201.0539	220.9821	217.6723	210.5612	195.8614	178.4200	136.3256	88.1434	63.3710 (83)	
Total gains	399.3338	448.0695	480.5485	499.5783	503.9832	485.4906	468.3724	458.4934	448.9198	422.5573	392.4355	380.9426 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
tau	102.6489	103.0140	103.3817	105.2603	105.6442	107.6067	107.6067	108.0079	106.8130	105.6442	104.8791	104.1250	104.1250
alpha	7.8433	7.8676	7.8921	8.0174	8.0429	8.1738	8.1738	8.2005	8.1209	8.0429	7.9919	7.9417	7.9417
util living area	0.9815	0.9564	0.9000	0.7778	0.6112	0.4318	0.3079	0.3276	0.5065	0.7854	0.9500	0.9860	0.9860 (86)
MIT	20.6320	20.7516	20.8740	20.9657	20.9950	20.9997	21.0000	21.0000	20.9991	20.9688	20.8079	20.6077	20.6077 (87)
Th 2	20.3616	20.3637	20.3659	20.3765	20.3787	20.3894	20.3894	20.3915	20.3851	20.3787	20.3744	20.3701	20.3701 (88)
util rest of house	0.9768	0.9465	0.8804	0.7457	0.5721	0.3908	0.2652	0.2843	0.4618	0.7482	0.9371	0.9823	0.9823 (89)
MIT 2	19.8820	20.0513	20.2176	20.3409	20.3744	20.3892	20.3893	20.3915	20.3844	20.3480	20.1406	19.8548	19.8548 (90)
Living area fraction									fLA = Living area / (4) =			0.5029	0.5029 (91)
MIT	20.2592	20.4034	20.5477	20.6551	20.6865	20.6962	20.6964	20.6975	20.6935	20.6601	20.4761	20.2334	20.2334 (92)
Temperature adjustment												0.0000	0.0000
adjusted MIT	20.2592	20.4034	20.5477	20.6551	20.6865	20.6962	20.6964	20.6975	20.6935	20.6601	20.4761	20.2334	20.2334 (93)

8. Space heating requirement

Utilisation	0.9760	0.9471	0.8864	0.7603	0.5916	0.4114	0.2867	0.3061	0.4843	0.7654	0.9394	0.9814	0.9814 (94)
Useful gains	389.7316	424.3886	425.9349	379.8513	298.1356	199.7359	134.2668	140.3312	217.4101	323.4429	368.6451	373.8417	373.8417 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	4.2000 (96)
Heat loss rate W	548.3668	530.8195	479.2663	393.8908	300.0260	199.8189	134.2703	140.3372	217.7251	335.8724	449.8393	543.1081	543.1081 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	118.0246	71.5216	39.6786	10.1084	1.4065	0.0000	0.0000	0.0000	0.0000	9.2475	58.4598	125.9343	125.9343 (98)
Space heating												434.3813	434.3813 (98)
Space heating per m2										(98) / (4) =		8.5525	8.5525 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	434.3813	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	456.1004	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1829.1942	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1920.6539	(310a)
Electricity used for heat distribution	23.7675	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	121.9912	(330a)
Total electricity for the above, kWh/year	121.9912	(331)
Electricity for lighting (calculated in Appendix L)	238.1302	(332)
Total delivered energy for all uses	2736.8757	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	2655.5913	0.2160	573.6077 (367)
Electrical energy for heat distribution	23.7675	0.5190	12.3354 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			585.9431 (373)
Space and water heating			585.9431 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	238.1302	0.5190	123.5896 (379)
Total CO2, kg/year			772.8461 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.2200 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER	15.2200	ZC1
Total Floor Area	50.7900	TFA
Assumed number of occupants	1.7134	N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	EF
CO2 emissions from appliances, equation (L14)	17.4175	ZC2
CO2 emissions from cooking, equation (L16)	3.1526	ZC3
Total CO2 emissions	35.7901	ZC4
Residual CO2 emissions offset from biofuel CHP	0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year	0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000	ZC7
Net CO2 emissions	35.7901	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1575 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4075 (18)
					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)					
External Wall	23.1000	8.4500	14.6500	0.1800	2.6370		(29a)					
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)					
Total net area of external elements Aum(A, m2)			40.6000				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	18.5395	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.2296 (36)					
Total fabric heat loss						(33) + (36) =	22.7691 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 24.3480	Feb 24.2160	Mar 24.0867	Apr 23.4794	May 23.3658	Jun 22.8368	Jul 22.8368	Aug 22.7389	Sep 23.0406	Oct 23.3658	Nov 23.5957	Dec 23.8360 (38)
Heat transfer coeff	47.1170	46.9851	46.8558	46.2485	46.1348	45.6059	45.6059	45.5079	45.8096	46.1348	46.3647	46.6050 (39)
Average = Sum(39)m / 12 =												46.2479 (39)
HLP	Jan 0.9277	Feb 0.9251	Mar 0.9225	Apr 0.9106	May 0.9083	Jun 0.8979	Jul 0.8979	Aug 0.8960	Sep 0.9019	Oct 0.9083	Nov 0.9129	Dec 0.9176 (40)
HLP (average)												0.9106 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan 82.3820	Feb 79.3863	Mar 76.3906	Apr 73.3949	May 70.3992	Jun 67.4035	Jul 67.4035	Aug 70.3992	Sep 73.3949	Oct 76.3906	Nov 79.3863	Dec 82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W
Southeast					6.2400	36.7938	0.6300	0.7000	0.7700			70.1668 (77)
South					2.2100	46.7521	0.6300	0.7000	0.7700			31.5766 (78)
Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains	421.2115	488.9806	537.3716	569.4289	581.3281	561.5651	541.7662	526.3621	510.2428	468.0154	419.7157	398.8747 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	74.8580	75.0681	75.2753	76.2638	76.4516	77.3383	77.3383	77.5048	76.9944	76.4516	76.0726	75.6803
alpha	5.9905	6.0045	6.0184	6.0843	6.0968	6.1559	6.1559	6.1670	6.1330	6.0968	6.0715	6.0454
util living area	0.9889	0.9730	0.9369	0.8513	0.7037	0.5153	0.3699	0.3969	0.6066	0.8695	0.9729	0.9916 (86)
MIT	20.2863	20.4588	20.6606	20.8552	20.9614	20.9951	20.9995	20.9992	20.9872	20.8591	20.5437	20.2519 (87)
Th 2	20.1440	20.1462	20.1484	20.1585	20.1604	20.1693	20.1693	20.1709	20.1658	20.1604	20.1566	20.1526 (88)
util rest of house	0.9856	0.9656	0.9205	0.8177	0.6508	0.4504	0.3003	0.3258	0.5385	0.8324	0.9641	0.9891 (89)
MIT 2	19.2087	19.4566	19.7392	20.0026	20.1264	20.1663	20.1691	20.1706	20.1571	20.0145	19.5885	19.1658 (90)
Living area fraction	19.7506	19.9606	20.2025	20.4313	20.5463	20.5831	20.5866	20.5872	20.5745	20.4392	20.0688	19.7120 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7506	19.9606	20.2025	20.4313	20.5463	20.5831	20.5866	20.5872	20.5745	20.4392	20.0688	19.7120 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9838	0.9637	0.9217	0.8292	0.6757	0.4829	0.3353	0.3616	0.5724	0.8456	0.9630	0.9875 (94)
Useful gains	414.3677	471.2247	495.2826	472.1728	392.8082	271.2034	181.6682	190.3214	292.0435	395.7686	404.2071	393.8892 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	727.9850	707.6224	642.0408	533.3063	408.1214	272.8626	181.8138	190.5525	296.5960	453.9310	601.2941	722.9350 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	233.3313	158.8593	109.1881	44.0161	11.3930	0.0000	0.0000	0.0000	0.0000	43.2728	141.9026	244.8100 (98)
Space heating												986.7733 (98)
Space heating per m2										(98) / (4) =		19.4285 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1055.3725 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	233.3313	158.8593	109.1881	44.0161	11.3930	0.0000	0.0000	0.0000	0.0000	43.2728	141.9026	244.8100	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	249.5522	169.9030	116.7787	47.0761	12.1850	0.0000	0.0000	0.0000	0.0000	46.2811	151.7675	261.8289	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	85.6783	84.9860	83.8697	82.1068	80.5220	79.8000	79.8000	79.8000	79.8000	82.0121	84.5958	85.8659	(216)
Fuel for water heating, kWh/month	196.9753	175.2483	187.0226	171.9951	172.4146	156.2471	150.8144	164.4484	163.8315	178.5184	182.0944	192.0554	(219)
Water heating fuel used												2091.6656	(219)
Annual totals kWh/year													
Space heating fuel - main system												1055.3725	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												3465.4144	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1055.3725	0.2160	227.9605 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2091.6656	0.2160	451.7998 (264)
Space and water heating			679.7602 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			844.9975 (272)
Emissions per m2 for space and water heating			13.3837 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.3837 * 1.00) + 2.4870 + 0.7664, rounded to 2 d.p.			16.6400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	123			Issued on Date	29/04/2022
Assessment Reference	123	Prop Type Ref			
Property					
SAP Rating	84 B	DER	15.22	TER	16.64
Environmental	90 B	% DER<TER	8.52		
CO ₂ Emissions (t/year)	0.69	DFEE	29.45	TFEE	31.81
General Requirements Compliance	Fail	% DFEE<TFEE	7.41		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aecom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.64 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.22 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)31.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)29.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing South East: 6.24 m², No overhang
Windows facing South: 2.21 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

					main heating	+	secondary heating	+	other	=	total	m3 per hour
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =										0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50											3.0000	
Infiltration rate											0.1500	(18)
Number of sides sheltered											3	(19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1163 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)					
External Wall	23.1000	8.4500	14.6500	0.1500	2.1975		(29a)					
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)					
Total net area of external elements Aum(A, m2)			40.6000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		17.6656		(33)					
Party Wall 1			33.8800	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.5610 (36)					
Total fabric heat loss							(33) + (36) = 23.2266 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 11.1341	Feb 11.0123	Mar 10.8905	Apr 10.2816	May 10.1599	Jun 9.5510	Jul 9.5510	Aug 9.4292	Sep 9.7945	Oct 10.1599	Nov 10.4034	Dec 10.6470 (38)
Heat transfer coeff	34.3607	34.2389	34.1171	33.5082	33.3864	32.7776	32.7776	32.6558	33.0211	33.3864	33.6300	33.8735 (39)
Average = Sum(39)m / 12 =	33.4778 (39)											
HLP	Jan 0.6765	Feb 0.6741	Mar 0.6717	Apr 0.6597	May 0.6573	Jun 0.6454	Jul 0.6454	Aug 0.6430	Sep 0.6501	Oct 0.6573	Nov 0.6621	Dec 0.6669 (40)
HLP (average)	0.6591 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan 82.3820	Feb 79.3863	Mar 76.3906	Apr 73.3949	May 70.3992	Jun 67.4035	Jul 67.4035	Aug 70.3992	Sep 73.3949	Oct 76.3906	Nov 79.3863	Dec 82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												

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Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (56)													
If cylinder contains dedicated solar storage													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (57)													
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month													
177.4469 156.7782 165.5372 149.6214 147.5136 133.0871 129.0318 139.9117 139.1394 155.0886 162.4461 173.5921 173.5921 (62)													
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
177.4469 156.7782 165.5372 149.6214 147.5136 133.0871 129.0318 139.9117 139.1394 155.0886 162.4461 173.5921 173.5921 (64)													
Total per year (kWh/year) = Sum(64)m =													1829.1942 (64)
Heat gains from water heating, kWh/month													
84.8430 75.4698 80.8830 74.7574 74.8902 69.2597 68.7450 72.3625 71.2721 77.4089 79.0216 83.5613 83.5613 (65)													

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
13.4839 11.9763 9.7398 7.3736 5.5119 4.6534 5.0281 6.5357 8.7723 11.1384 13.0002 13.8587 13.8587 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
149.2855 150.8347 146.9309 138.6204 128.1298 118.2701 111.6832 110.1341 114.0378 122.3484 132.8390 142.6987 142.6987 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 (69)													
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													
-68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 (71)													
Water heating gains (Table 5)													
114.0363 112.3063 108.7138 103.8297 100.6589 96.1941 92.3992 97.2615 98.9891 104.0442 109.7522 112.3135 112.3135 (72)													
Total internal gains	325.5065	323.8179	314.0852	298.5244	283.0012	267.8182	257.8112	262.6320	270.4999	286.2317	304.2921	317.5716	317.5716 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W	
Southeast					6.2400	36.7938	0.4000	0.8000			0.7700	50.9147 (77)	
South					2.2100	46.7521	0.4000	0.8000			0.7700	22.9127 (78)	

Solar gains	73.8274	124.2516	166.4633	201.0539	220.9821	217.6723	210.5612	195.8614	178.4200	136.3256	88.1434	63.3710 (83)	
Total gains	399.3338	448.0695	480.5485	499.5783	503.9832	485.4906	468.3724	458.4934	448.9198	422.5573	392.4355	380.9426 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
tau	102.6489	103.0140	103.3817	105.2603	105.6442	107.6067	107.6067	108.0079	106.8130	105.6442	104.8791	104.1250	104.1250
alpha	7.8433	7.8676	7.8921	8.0174	8.0429	8.1738	8.1738	8.2005	8.1209	8.0429	7.9919	7.9417	7.9417
util living area	0.9815	0.9564	0.9000	0.7778	0.6112	0.4318	0.3079	0.3276	0.5065	0.7854	0.9500	0.9860	0.9860 (86)
MIT	20.6320	20.7516	20.8740	20.9657	20.9950	20.9997	21.0000	21.0000	20.9991	20.9688	20.8079	20.6077	20.6077 (87)
Th 2	20.3616	20.3637	20.3659	20.3765	20.3787	20.3894	20.3894	20.3915	20.3851	20.3787	20.3744	20.3701	20.3701 (88)
util rest of house	0.9768	0.9465	0.8804	0.7457	0.5721	0.3908	0.2652	0.2843	0.4618	0.7482	0.9371	0.9823	0.9823 (89)
MIT 2	19.8820	20.0513	20.2176	20.3409	20.3744	20.3892	20.3893	20.3915	20.3844	20.3480	20.1406	19.8548	19.8548 (90)
Living area fraction									fLA = Living area / (4) =			0.5029	0.5029 (91)
MIT	20.2592	20.4034	20.5477	20.6551	20.6865	20.6962	20.6964	20.6975	20.6935	20.6601	20.4761	20.2334	20.2334 (92)
Temperature adjustment												0.0000	0.0000
adjusted MIT	20.2592	20.4034	20.5477	20.6551	20.6865	20.6962	20.6964	20.6975	20.6935	20.6601	20.4761	20.2334	20.2334 (93)

8. Space heating requirement

Utilisation	0.9760	0.9471	0.8864	0.7603	0.5916	0.4114	0.2867	0.3061	0.4843	0.7654	0.9394	0.9814	0.9814 (94)
Useful gains	389.7316	424.3886	425.9349	379.8513	298.1356	199.7359	134.2668	140.3312	217.4101	323.4429	368.6451	373.8417	373.8417 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	4.2000 (96)
Heat loss rate W	548.3668	530.8195	479.2663	393.8908	300.0260	199.8189	134.2703	140.3372	217.7251	335.8724	449.8393	543.1081	543.1081 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	118.0246	71.5216	39.6786	10.1084	1.4065	0.0000	0.0000	0.0000	0.0000	9.2475	58.4598	125.9343	125.9343 (98)
Space heating												434.3813	434.3813 (98)
Space heating per m2										(98) / (4) =		8.5525	8.5525 (99)

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8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	434.3813	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	456.1004	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1829.1942	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1920.6539	(310a)
Electricity used for heat distribution	23.7675	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	121.9912	(330a)
Total electricity for the above, kWh/year	121.9912	(331)
Electricity for lighting (calculated in Appendix L)	238.1302	(332)
Total delivered energy for all uses	2736.8757	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	2655.5913	0.2160	573.6077 (367)
Electrical energy for heat distribution	23.7675	0.5190	12.3354 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			585.9431 (373)
Space and water heating			585.9431 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	238.1302	0.5190	123.5896 (379)
Total CO2, kg/year			772.8461 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.2200 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER	15.2200	ZC1
Total Floor Area	50.7900	TFA
Assumed number of occupants	1.7134	N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	EF
CO2 emissions from appliances, equation (L14)	17.4175	ZC2
CO2 emissions from cooking, equation (L16)	3.1526	ZC3
Total CO2 emissions	35.7901	ZC4
Residual CO2 emissions offset from biofuel CHP	0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year	0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000	ZC7
Net CO2 emissions	35.7901	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1575 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4075 (18)
					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
Effective ac	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)					
External Wall	23.1000	8.4500	14.6500	0.1800	2.6370		(29a)					
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)					
Total net area of external elements Aum(A, m2)			40.6000				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.5395		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.2296 (36)					
Total fabric heat loss						(33) + (36) =	22.7691 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 24.3480	Feb 24.2160	Mar 24.0867	Apr 23.4794	May 23.3658	Jun 22.8368	Jul 22.8368	Aug 22.7389	Sep 23.0406	Oct 23.3658	Nov 23.5957	Dec 23.8360 (38)
Heat transfer coeff	47.1170	46.9851	46.8558	46.2485	46.1348	45.6059	45.6059	45.5079	45.8096	46.1348	46.3647	46.6050 (39)
Average = Sum(39)m / 12 =												46.2479 (39)
HLP	Jan 0.9277	Feb 0.9251	Mar 0.9225	Apr 0.9106	May 0.9083	Jun 0.8979	Jul 0.8979	Aug 0.8960	Sep 0.9019	Oct 0.9083	Nov 0.9129	Dec 0.9176 (40)
HLP (average)												0.9106 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan 82.3820	Feb 79.3863	Mar 76.3906	Apr 73.3949	May 70.3992	Jun 67.4035	Jul 67.4035	Aug 70.3992	Sep 73.3949	Oct 76.3906	Nov 79.3863	Dec 82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

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If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415	(73)

6. Solar gains

[Jan]		Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W					
Southeast		6.2400	36.7938	0.6300	0.7000	0.7700	70.1668 (77)					
South		2.2100	46.7521	0.6300	0.7000	0.7700	31.5766 (78)					
Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains	421.2115	488.9806	537.3716	569.4289	581.3281	561.5651	541.7662	526.3621	510.2428	468.0154	419.7157	398.8747 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	74.8580	75.0681	75.2753	76.2638	76.4516	77.3383	77.3383	77.5048	76.9944	76.4516	76.0726	75.6803
alpha	5.9905	6.0045	6.0184	6.0843	6.0968	6.1559	6.1559	6.1670	6.1330	6.0968	6.0715	6.0454
util living area	0.9889	0.9730	0.9369	0.8513	0.7037	0.5153	0.3699	0.3969	0.6066	0.8695	0.9729	0.9916 (86)
MIT	20.2863	20.4588	20.6606	20.8552	20.9614	20.9951	20.9995	20.9992	20.9872	20.8591	20.5437	20.2519 (87)
Th 2	20.1440	20.1462	20.1484	20.1585	20.1604	20.1693	20.1693	20.1709	20.1658	20.1604	20.1566	20.1526 (88)
util rest of house	0.9856	0.9656	0.9205	0.8177	0.6508	0.4504	0.3003	0.3258	0.5385	0.8324	0.9641	0.9891 (89)
MIT 2	19.2087	19.4566	19.7392	20.0026	20.1264	20.1663	20.1691	20.1706	20.1571	20.0145	19.5885	19.1658 (90)
Living area fraction	19.7506	19.9606	20.2025	20.4313	20.5463	20.5831	20.5866	20.5872	20.5745	20.4392	20.0688	19.7120 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7506	19.9606	20.2025	20.4313	20.5463	20.5831	20.5866	20.5872	20.5745	20.4392	20.0688	19.7120 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9838	0.9637	0.9217	0.8292	0.6757	0.4829	0.3353	0.3616	0.5724	0.8456	0.9630	0.9875	(94)
Useful gains	414.3677	471.2247	495.2826	472.1728	392.8082	271.2034	181.6682	190.3214	292.0435	395.7686	404.2071	393.8892	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	727.9850	707.6224	642.0408	533.3063	408.1214	272.8626	181.8138	190.5525	296.5960	453.9310	601.2941	722.9350	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	233.3313	158.8593	109.1881	44.0161	11.3930	0.0000	0.0000	0.0000	0.0000	43.2728	141.9026	244.8100	(98)
Space heating												986.7733	(98)
Space heating per m2												19.4285	(99)
										(98) / (4) =			

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1055.3725 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	233.3313	158.8593	109.1881	44.0161	11.3930	0.0000	0.0000	0.0000	0.0000	43.2728	141.9026	244.8100	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	249.5522	169.9030	116.7787	47.0761	12.1850	0.0000	0.0000	0.0000	0.0000	46.2811	151.7675	261.8289	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	85.6783	84.9860	83.8697	82.1068	80.5220	79.8000	79.8000	79.8000	79.8000	82.0121	84.5958	85.8659	(216)
Fuel for water heating, kWh/month	196.9753	175.2483	187.0226	171.9951	172.4146	156.2471	150.8144	164.4484	163.8315	178.5184	182.0944	192.0554	(219)
Water heating fuel used												2091.6656	(219)
Annual totals kWh/year													
Space heating fuel - main system												1055.3725	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												3465.4144	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1055.3725	0.2160	227.9605 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2091.6656	0.2160	451.7998 (264)
Space and water heating			679.7602 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			844.9975 (272)
Emissions per m2 for space and water heating			13.3837 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.3837 * 1.00) + 2.4870 + 0.7664, rounded to 2 d.p.			16.6400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	124	Issued on Date	29/04/2022
Assessment Reference	124	Prop Type Ref	
Property			
SAP Rating	85 B	DER	13.94
Environmental	90 B	TER	15.10
CO ₂ Emissions (t/year)	0.88	% DER<TER	7.68
General Requirements Compliance	Fail	DFEE	31.81
		TFEE	35.64
		% DFEE<TFEE	10.73
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 74 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 15.10 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.94 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)35.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)31.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading: Average
Windows facing South East: 6.24 m², No overhang
Windows facing South: 2.21 m², No overhang
Windows facing South West: 9.35 m², No overhang
Windows facing West: 1.97 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

					main	secondary	other			total	m3 per hour		
					heating		heating						
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)	
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)	
Number of intermittent fans											0 * 10 =	0.0000 (7a)	
Number of passive vents											0 * 10 =	0.0000 (7b)	
Number of flueless gas fires											0 * 40 =	0.0000 (7c)	
											Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =										0.0000 / (5) =		0.0000 (8)	
Pressure test										Yes			
Measured/design AP50												3.0000	
Infiltration rate												0.1500 (18)	
Number of sides sheltered												2 (19)	
Shelter factor										(20) = 1 - [0.075 x (19)] =		0.8500 (20)	
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =		0.1275 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)	
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)	
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)	
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation:												0.5000 (23a)	
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)	
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)	

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			19.7700	1.1450	22.6374		(27)					
External Wall	52.9500	19.7700	33.1800	0.1500	4.9770		(29a)					
Corridor	5.4000	1.8900	3.5100	0.2500	0.8775		(29a)					
Total net area of external elements Aum(A, m2)			58.3500				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		30.3819		(33)					
Party Wall 1			34.8500	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							250.0000 (35)					
Total fabric heat loss							9.1430 (36)					
							(33) + (36) = 39.5249 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 17.2447	Feb 17.0514	Mar 16.8580	Apr 15.8913	May 15.6980	Jun 14.7313	Jul 14.7313	Aug 14.5380	Sep 15.1180	Oct 15.6980	Nov 16.0847	Dec 16.4714 (38)
Heat transfer coeff	56.7696	56.5763	56.3829	55.4163	55.2229	54.2562	54.2562	54.0629	54.6429	55.2229	55.6096	55.9963 (39)
Average = Sum(39)m / 12 =												55.3679 (39)
HLP	Jan 0.7722	Feb 0.7695	Mar 0.7669	Apr 0.7538	May 0.7511	Jun 0.7380	Jul 0.7380	Aug 0.7353	Sep 0.7432	Oct 0.7511	Nov 0.7564	Dec 0.7616 (40)
HLP (average)												0.7531 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	Jan 98.4511	Feb 94.8710	Mar 91.2910	Apr 87.7110	May 84.1309	Jun 80.5509	Jul 80.5509	Aug 84.1309	Sep 87.7110	Oct 91.2910	Nov 94.8710	Dec 98.4511 (44)
Energy conte	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Energy content (annual)										Total = Sum(45)m =		1408.1991 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (56)													
If cylinder contains dedicated solar storage													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (57)													
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month													
201.2769 177.6201 187.0442 168.3717 165.5050 148.6122 143.4181 156.4202 155.8451 174.5575 183.6979 196.6701 196.6701 (62)													
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
201.2769 177.6201 187.0442 168.3717 165.5050 148.6122 143.4181 156.4202 155.8451 174.5575 183.6979 196.6701 196.6701 (64)													
Total per year (kWh/year) = Sum(64)m =													2059.0388 (64)
Heat gains from water heating, kWh/month													
92.7665 82.3997 88.0341 80.9919 80.8723 74.4219 73.5284 77.8516 76.8268 83.8823 86.0878 91.2347 91.2347 (65)													

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)													
(66)m 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 (66)													
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
18.3088 16.2617 13.2249 10.0121 7.4842 6.3185 6.8273 8.8744 11.9112 15.1240 17.6520 18.8177 18.8177 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
205.3693 207.5004 202.1301 190.6974 176.2657 162.7019 153.6405 151.5094 156.8797 168.3123 182.7441 196.3078 196.3078 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 (69)													
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													
-93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 (71)													
Water heating gains (Table 5)													
124.6861 122.6187 118.3254 112.4887 108.6993 103.3637 98.8285 104.6393 106.7039 112.7450 119.5664 122.6273 122.6273 (72)													
Total internal gains													
406.2912 404.3077 391.6074 371.1252 350.3761 330.3110 317.2233 322.9500 333.4217 354.1083 377.8894 395.6798 395.6798 (73)													

6. Solar gains

[Jan]													
Area m2													
Solar flux Table 6a W/m2													
Specific data or Table 6b													
Specific data or Table 6c													
Access factor Table 6d													
Gains W													
Southeast	6.2400	36.7938	0.4000	0.8000	0.7700	50.9147 (77)							
South	2.2100	46.7521	0.4000	0.8000	0.7700	22.9127 (78)							
Southwest	9.3500	36.7938	0.4000	0.8000	0.7700	76.2904 (79)							
West	1.9700	19.6403	0.4000	0.8000	0.7700	8.5802 (80)							
Solar gains	158.6979	270.9870	371.9096	461.6762	517.1520	513.2277	494.8979	453.6712	403.0932	299.8653	190.2202	135.7156 (83)	
Total gains	564.9891	675.2948	763.5169	832.8014	867.5282	843.5387	812.1211	776.6213	736.5149	653.9736	568.1096	531.3954 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)													
tau 89.9347 90.2420 90.5514 92.1310 92.4536 94.1008 94.1008 94.4373 93.4349 92.4536 91.8107 91.1767 91.1767 (86)													
alpha 6.9956 7.0161 7.0368 7.1421 7.1636 7.2734 7.2734 7.2958 7.2290 7.1636 7.1207 7.0784 7.0784 (86)													
util living area 0.9890 0.9652 0.9034 0.7649 0.5863 0.4113 0.2939 0.3202 0.5099 0.8137 0.9678 0.9923 (86)													
MIT 20.4660 20.6444 20.8245 20.9538 20.9932 20.9996 21.0000 20.9999 20.9980 20.9419 20.6929 20.4317 (87)													
Th 2 20.2775 20.2798 20.2821 20.2936 20.2959 20.3074 20.3074 20.3097 20.3028 20.2959 20.2913 20.2867 (88)													
util rest of house 0.9859 0.9565 0.8831 0.7298 0.5439 0.3669 0.2477 0.2722 0.4593 0.7747 0.9582 0.9901 (89)													
MIT 2 19.5743 19.8291 20.0754 20.2460 20.2901 20.3071 20.3074 20.3097 20.3014 20.2378 19.9100 19.5323 (90)													
Living area fraction fLA = Living area / (4) =													
MIT 19.9022 20.1289 20.3509 20.5063 20.5487 20.5618 20.5621 20.5636 20.5576 20.4967 20.1979 19.8631 (92)													
Temperature adjustment 0.0000													
adjusted MIT 19.9022 20.1289 20.3509 20.5063 20.5487 20.5618 20.5621 20.5636 20.5576 20.4967 20.1979 19.8631 (93)													

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.9840 0.9544 0.8852 0.7407 0.5592 0.3832 0.2647 0.2898 0.4779 0.7863 0.9568 0.9884 (94)													
Useful gains	555.9318	644.5010	675.8881	616.8285	485.1215	323.2778	214.9595	225.0750	351.9614	514.2465	543.5409	525.2536 (95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W	885.7334	861.5951	780.9539	643.1784	488.6489	323.4649	214.9695	225.0940	352.8633	546.5273	728.3705	877.0750 (97)	
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)	
Space heating kWh	245.3724	145.8872	78.1690	18.9719	2.6244	0.0000	0.0000	0.0000	0.0000	24.0169	133.0773	261.7551 (98)	
Space heating													
Space heating per m2													
(98) / (4) =													12.3759 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	909.8743 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	955.3680 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating:	
Annual water heating requirement	2059.0388 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2161.9908 (310a)
Electricity used for heat distribution	31.1736 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	170.9800 (330a)
Total electricity for the above, kWh/year	170.9800 (331)
Electricity for lighting (calculated in Appendix L)	323.3395 (332)
Total delivered energy for all uses	3611.6782 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3483.0824	0.2160	752.3458 (367)
Electrical energy for heat distribution	31.1736	0.5190	16.1791 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			768.5249 (373)
Space and water heating			768.5249 (376)
Pumps and fans	170.9800	0.5190	88.7386 (378)
Energy for lighting	323.3395	0.5190	167.8132 (379)
Total CO2, kg/year			1025.0767 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			13.9400 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		13.9400 ZC1
Total Floor Area	TFA	73.5200
Assumed number of occupants	N	2.3285
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.5530 ZC2
CO2 emissions from cooking, equation (L16)		2.3787 ZC3
Total CO2 emissions		32.8717 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		32.8717 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1632 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4132 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3512 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4478	0.4390	0.4303	0.3864	0.3776	0.3337	0.3337	0.3249	0.3512	0.3776	0.3951	0.4127 (22b)
	0.6003	0.5964	0.5926	0.5746	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			16.4900	1.3258	21.8617		(27)					
External Wall	52.9500	16.4900	36.4600	0.1800	6.5628		(29a)					
Corridor	5.4000	1.8900	3.5100	0.1800	0.6318		(29a)					
Total net area of external elements Aum(A, m2)			58.3500				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.9463		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.0636 (36)					
Total fabric heat loss						(33) + (36) =	38.0099 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 36.4091	Feb 36.1729	Mar 35.9414	Apr 34.8541	May 34.6506	Jun 33.7036	Jul 33.7036	Aug 33.5282	Sep 34.0684	Oct 34.6506	Nov 35.0622	Dec 35.4924 (38)
Heat transfer coeff	74.4190	74.1828	73.9514	72.8640	72.6606	71.7135	71.7135	71.5382	72.0783	72.6606	73.0721	73.5024 (39)
Average = Sum(39)m / 12 =												72.8630 (39)
HLP	Jan 1.0122	Feb 1.0090	Mar 1.0059	Apr 0.9911	May 0.9883	Jun 0.9754	Jul 0.9754	Aug 0.9730	Sep 0.9804	Oct 0.9883	Nov 0.9939	Dec 0.9998 (40)
HLP (average)												0.9911 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy conte	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Energy content (annual)										Total = Sum(45)m =		1408.1991 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
	85.8210	76.1264	81.0886	74.2704	73.9268	67.7004	66.5829	70.9061	70.1053	76.9367	79.3664	84.2892 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3070	16.2601	13.2236	10.0111	7.4834	6.3178	6.8266	8.8735	11.9100	15.1225	17.6502	18.8158	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	(71)
Water heating gains (Table 5)	115.3508	113.2833	108.9900	103.1533	99.3640	94.0283	89.4931	95.3039	97.3685	103.4096	110.2311	113.2919	(72)
Total internal gains	399.9539	397.9707	385.2706	364.7888	344.0400	323.9750	310.8872	316.6137	327.0851	347.7714	371.5522	389.3425	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g	Specific data or Table 6b	FF	Specific data or Table 6c	Access factor Table 6d	Gains W		
Southeast				5.2100	36.7938		0.6300		0.7000	0.7700	58.5847	(77)	
South				1.8400	46.7521		0.6300		0.7000	0.7700	26.2900	(78)	
Southwest				7.8000	36.7938		0.6300		0.7000	0.7700	87.7085	(79)	
West				1.6400	19.6403		0.6300		0.7000	0.7700	9.8438	(80)	
Solar gains	182.4270	311.5043	427.5134	530.6984	594.4675	589.9567	568.8863	521.4963	463.3582	344.6994	218.6622	156.0085	(83)
Total gains	582.3809	709.4749	812.7841	895.4872	938.5075	913.9316	879.7735	838.1100	790.4433	692.4707	590.2145	545.3510	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6055	68.8239	69.0394	70.0696	70.2658	71.1937	71.1937	71.3683	70.8334	70.2658	69.8701	69.4611	
alpha	5.5737	5.5883	5.6026	5.6713	5.6844	5.7462	5.7462	5.7579	5.7222	5.6844	5.6580	5.6307	
util living area	0.9922	0.9772	0.9390	0.8434	0.6850	0.4974	0.3580	0.3915	0.6120	0.8849	0.9800	0.9944	(86)
MIT	20.1287	20.3430	20.5945	20.8337	20.9567	20.9942	20.9993	20.9988	20.9820	20.8119	20.4251	20.0904	(87)
Th 2	20.0732	20.0758	20.0784	20.0908	20.0931	20.1039	20.1039	20.1059	20.0997	20.0931	20.0884	20.0835	(88)
util rest of house	0.9898	0.9706	0.9225	0.8076	0.6290	0.4299	0.2855	0.3160	0.5391	0.8487	0.9731	0.9926	(89)
MIT 2	18.9267	19.2363	19.5898	19.9131	20.0555	20.1004	20.1036	20.1054	20.0875	19.8964	19.3668	18.8791	(90)
Living area fraction	19.3688	19.6434	19.9593	20.2517	20.3869	20.4291	20.4330	20.4340	20.4165	20.2331	19.7560	19.3246	(92)
Temperature adjustment	19.3688	19.6434	19.9593	20.2517	20.3869	20.4291	20.4330	20.4340	20.4165	20.2331	19.7560	19.3246	(93)
adjusted MIT	19.3688	19.6434	19.9593	20.2517	20.3869	20.4291	20.4330	20.4340	20.4165	20.2331	19.7560	19.3246	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9874	0.9668	0.9201	0.8144	0.6477	0.4546	0.3122	0.3438	0.5653	0.8549	0.9700	0.9907	(94)
Ext temp.	575.0202	685.9200	747.8324	729.2656	607.8729	415.4799	274.6429	288.1747	446.8606	592.0102	572.4993	540.2693	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1121.4021	1093.7042	995.3329	827.1285	631.1973	418.0258	274.8792	288.5832	455.2835	699.9457	924.8020	1111.6934	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	406.5081	274.0310	184.1403	70.4612	17.3534	0.0000	0.0000	0.0000	0.0000	80.3041	253.6580	425.1395	(98)
Space heating per m2												1711.5957	(98)
												23.2807	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1830.5836 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	406.5081	274.0310	184.1403	70.4612	17.3534	0.0000	0.0000	0.0000	0.0000	80.3041	253.6580	425.1395	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	434.7680	293.0813	196.9415	75.3596	18.5598	0.0000	0.0000	0.0000	0.0000	85.8867	271.2920	454.6947	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882	(64)
Efficiency of water heater (217)m	86.7602	86.0844	84.8989	82.7932	80.7512	79.8000	79.8000	79.8000	79.8000	83.0011	85.7986	86.9264	(216)
Fuel for water heating, kWh/month	221.9854	197.2232	210.0879	193.2161	194.2052	175.7022	168.8423	185.1357	184.7660	199.8474	204.3109	216.2615	(219)
Water heating fuel used												2351.5838	(219)
Annual totals kWh/year													
Space heating fuel - main system												1830.5836	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												323.3067	(232)
Total delivered energy for all uses												4580.4741	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1830.5836	0.2160	395.4061 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2351.5838	0.2160	507.9421 (264)
Space and water heating			903.3481 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	323.3067	0.5190	167.7962 (268)
Total CO2, kg/m2/year			1110.0693 (272)
Emissions per m2 for space and water heating			12.2871 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2823 (272b)
Emissions per m2 for pumps and fans			0.5294 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.2871 * 1.00) + 2.2823 + 0.5294, rounded to 2 d.p.			15.1000 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	125	Issued on Date	29/04/2022
Assessment Reference	125	Prop Type Ref	
Property			
SAP Rating	84 B	DER	17.27
Environmental	87 B	TER	18.67
CO ₂ Emissions (t/year)	1.03	% DER<TER	7.51
General Requirements Compliance	Pass	DFEE	45.80
		TFEE	53.03
		% DFEE<TFEE	13.64
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.67 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.27 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)53.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)45.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK
Based on:
Overshading: Average
Windows facing West: 5.88 m², No overhang
Windows facing North West: 7.07 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main		secondary		other		total		m3 per hour			
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)			
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)			
Number of intermittent fans							0 * 10 =	0.0000	(7a)			
Number of passive vents							0 * 10 =	0.0000	(7b)			
Number of flueless gas fires							0 * 40 =	0.0000	(7c)			
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000	(8)			
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							2	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500	(20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1275	(21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			12.9500	1.1450	14.8282		(27)					
External Wall	35.0800	12.9500	22.1300	0.1500	3.3195		(29a)					
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)					
Core	18.2300		18.2300	0.2500	4.5575		(29a)					
Main Roof	72.7700		72.7700	0.1000	7.2770		(30)					
Total net area of external elements Aum(A, m2)			143.5800				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		35.7747		(33)					
Party Wall 1			18.3000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.2124 (36)					
Total fabric heat loss							(33) + (36) = 45.9871 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 17.0688	Feb 16.8774	Mar 16.6860	Apr 15.7292	May 15.5379	Jun 14.5811	Jul 14.5811	Aug 14.3897	Sep 14.9638	Oct 15.5379	Nov 15.9206	Dec 16.3033 (38)
Heat transfer coeff	63.0559	62.8646	62.6732	61.7164	61.5250	60.5682	60.5682	60.3768	60.9509	61.5250	61.9077	62.2905 (39)
Average = Sum(39)m / 12 =												61.6685 (39)
HLP	Jan 0.8665	Feb 0.8639	Mar 0.8613	Apr 0.8481	May 0.8455	Jun 0.8323	Jul 0.8323	Aug 0.8297	Sep 0.8376	Oct 0.8455	Nov 0.8507	Dec 0.8560 (40)
HLP (average)												0.8474 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	Jan 98.0067	Feb 94.4428	Mar 90.8789	Apr 87.3151	May 83.7512	Jun 80.1873	Jul 80.1873	Aug 83.7512	Sep 87.3151	Oct 90.8789	Nov 94.4428	Dec 98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)												Total = Sum(45)m = 1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												

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Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)
Water storage loss:												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h												
200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(64)
Heat gains from water heating, kWh/month												
92.5474	82.2081	87.8363	80.8195	80.7069	74.2791	73.3961	77.6998	76.6732	83.7032	85.8924	91.0225	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
18.2553	16.2142	13.1863	9.9829	7.4623	6.3000	6.8074	8.8485	11.8764	15.0798	17.6004	18.7627	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	(71)
Water heating gains (Table 5)												
124.3916	122.3335	118.0596	112.2492	108.4770	103.1654	98.6507	104.4353	106.4905	112.5044	119.2950	122.3421	(72)
Total internal gains												
403.9925	402.0068	389.3790	369.0270	348.4216	328.4959	315.5019	321.2141	331.6232	352.1788	375.8026	393.4637	(73)

6. Solar gains

[Jan]				Area	Solar flux	g		FF			Access			Gains	
				m2	Table 6a	Specific data			Specific data			factor			W
					W/m2	or Table 6b			or Table 6c			Table 6d			
West				5.8800	19.6403	0.4000			0.8000			0.7700			25.6099 (80)
Northwest				7.0700	11.2829	0.4000			0.8000			0.7700			17.6899 (81)
Solar gains	43.2998	86.1067	147.3804	226.8726	290.6833	303.6424	286.5514	237.3201	175.0084	103.4509	54.1910			35.5068 (83)	
Total gains	447.2923	488.1134	536.7594	595.8996	639.1049	632.1383	602.0533	558.5342	506.6316	455.6297	429.9935			428.9705 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1427	80.3867	80.6321	81.8822	82.1369	83.4344	83.4344	83.6988	82.9105	82.1369	81.6291	81.1275	
alpha	6.3428	6.3591	6.3755	6.4588	6.4758	6.5623	6.5623	6.5799	6.5274	6.4758	6.4419	6.4085	
util living area	0.9975	0.9950	0.9854	0.9422	0.8139	0.6034	0.4415	0.4947	0.7746	0.9653	0.9942	0.9981 (86)	
MIT	20.1741	20.2832	20.4826	20.7470	20.9289	20.9915	20.9990	20.9981	20.9615	20.7267	20.4090	20.1568 (87)	
Th 2	20.1961	20.1983	20.2006	20.2118	20.2141	20.2254	20.2254	20.2277	20.2209	20.2141	20.2096	20.2051 (88)	
util rest of house	0.9967	0.9934	0.9806	0.9240	0.7669	0.5347	0.3644	0.4130	0.7071	0.9506	0.9921	0.9974 (89)	
MIT 2	19.0868	19.2474	19.5376	19.9168	20.1467	20.2199	20.2250	20.2269	20.1912	19.8971	19.4399	19.0685 (90)	
Living area fraction									fLA = Living area / (4) =				0.3848 (91)
MIT	19.5052	19.6459	19.9012	20.2362	20.4477	20.5168	20.5228	20.5236	20.4876	20.2163	19.8128	19.4872 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.5052	19.6459	19.9012	20.2362	20.4477	20.5168	20.5228	20.5236	20.4876	20.2163	19.8128	19.4872 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9957	0.9919	0.9784	0.9246	0.7817	0.5609	0.3941	0.4445	0.7315	0.9506	0.9907	0.9967	(94)
Useful gains	445.3911	484.1661	525.1771	550.9971	499.5890	354.5725	237.2773	248.2905	370.5910	433.1437	425.9768	427.5443	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	958.7761	926.9968	839.8961	699.6299	538.2012	358.3692	237.5998	248.9696	389.3289	591.6441	787.0180	952.2493	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	381.9585	297.5822	234.1509	107.0156	28.7274	0.0000	0.0000	0.0000	0.0000	117.9243	259.9497	390.3805	(98)
Space heating												1817.6892	(98)
Space heating per m2											(98) / (4) =	24.9786	(99)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	1817.6892	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1908.5737	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating:		
Annual water heating requirement	2052.6825	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2155.3166	(310a)
Electricity used for heat distribution	40.6389	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)		
mechanical ventilation fans (SFP = 0.7625)	169.2357	(330a)
Total electricity for the above, kWh/year	169.2357	(331)
Electricity for lighting (calculated in Appendix L)	322.3944	(332)
Total delivered energy for all uses	4555.5203	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	4540.6595	0.2160	980.7824 (367)
Electrical energy for heat distribution	40.6389	0.5190	21.0916 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1001.8740 (373)
Space and water heating			1001.8740 (376)
Pumps and fans	169.2357	0.5190	87.8333 (378)
Energy for lighting	322.3944	0.5190	167.3227 (379)
Total CO2, kg/year			1257.0301 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			17.2700 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		17.2700	ZC1
Total Floor Area	TFA	72.7700	
Assumed number of occupants	N	2.3115	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.5855	ZC2
CO2 emissions from cooking, equation (L16)		2.3976	ZC3
Total CO2 emissions		36.2531	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		36.2531	ZC8

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1649 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4149 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3527 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4497	0.4408	0.4320	0.3879	0.3791	0.3350	0.3350	0.3262	0.3527	0.3791	0.3968	0.4144 (22b)
Effective ac	0.6011	0.5972	0.5933	0.5752	0.5719	0.5561	0.5561	0.5532	0.5622	0.5719	0.5787	0.5859 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			12.9500	1.3258	17.1686		(27)					
External Wall	35.0800	12.9500	22.1300	0.1800	3.9834		(29a)					
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)					
Core	18.2300		18.2300	0.1800	3.2814		(29a)					
Main Roof	72.7700		72.7700	0.1300	9.4601		(30)					
Total net area of external elements Aum(A, m2)			143.5800				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)... (30) + (32) =	38.5933		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.0924 (36)					
Total fabric heat loss						(33) + (36) =	46.6857 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 36.0868	Feb 35.8511	Mar 35.6201	Apr 34.5351	May 34.3321	Jun 33.3870	Jul 33.3870	Aug 33.2120	Sep 33.7511	Oct 34.3321	Nov 34.7427	Dec 35.1721 (38)
Heat transfer coeff	82.7724	82.5368	82.3058	81.2207	81.0177	80.0727	80.0727	79.8977	80.4367	81.0177	81.4284	81.8577 (39)
Average = Sum(39)m / 12 =												81.2198 (39)
HLP	Jan 1.1375	Feb 1.1342	Mar 1.1310	Apr 1.1161	May 1.1133	Jun 1.1004	Jul 1.1004	Aug 1.0979	Sep 1.1054	Oct 1.1133	Nov 1.1190	Dec 1.1249 (40)
HLP (average)												1.1161 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)										Total = Sum(45)m =		1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												
21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133	(46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (64)
Heat gains from water heating, kWh/month	85.6018	75.9347	80.8908	74.0980	73.7613	67.5576	66.4506	70.7543	69.9517	76.7577	79.1709	84.0770 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5798	16.5024	13.4206	10.1603	7.5949	6.4120	6.9283	9.0057	12.0875	15.3478	17.9132	19.0961	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	(71)
Water heating gains (Table 5)	115.0562	112.9981	108.7242	102.9139	99.1416	93.8300	89.3153	95.0999	97.1551	103.1690	109.9597	113.0067	(72)
Total internal gains	397.9816	395.9596	383.2780	362.8690	342.2188	322.2725	309.2875	315.0360	325.4989	346.1114	369.7800	387.4618	(73)

6. Solar gains

[Jan]				Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W	
West				5.8800	19.6403	0.6300	0.7000	0.7700			35.2936 (80)	
Northwest				7.0700	11.2829	0.6300	0.7000	0.7700			24.3789 (81)	
Solar gains	59.6725	118.6657	203.1086	312.6588	400.5979	418.4572	394.9036	327.0568	241.1834	142.5683	74.6819	48.9328 (83)
Total gains	457.6541	514.6253	586.3866	675.5278	742.8167	740.7297	704.1911	642.0927	566.6823	488.6797	444.4619	436.3946 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.0526	61.2269	61.3988	62.2190	62.3749	63.1110	63.1110	63.2493	62.8254	62.3749	62.0603	61.7348
alpha	5.0702	5.0818	5.0933	5.1479	5.1583	5.2074	5.2074	5.2166	5.1884	5.1583	5.1374	5.1157
util living area	0.9975	0.9950	0.9862	0.9496	0.8435	0.6570	0.4934	0.5586	0.8296	0.9738	0.9950	0.9981 (86)
MIT	19.8025	19.9429	20.2033	20.5568	20.8351	20.9664	20.9937	20.9885	20.8895	20.5235	20.1049	19.7817 (87)
Th 2	19.9704	19.9730	19.9756	19.9877	19.9900	20.0005	20.0005	20.0025	19.9965	19.9900	19.9854	19.9806 (88)
util rest of house	0.9967	0.9934	0.9813	0.9314	0.7927	0.5685	0.3850	0.4445	0.7558	0.9610	0.9930	0.9974 (89)
MIT 2	18.3772	18.5837	18.8632	19.4716	19.8324	19.9790	19.9983	19.9979	19.9088	19.4359	18.8298	18.3541 (90)
Living area fraction	18.9256	19.1067	19.4404	19.8891	20.2182	20.3589	20.3813	20.3790	20.2861	fLA = Living area / (4) =		0.3848 (91)
MIT	18.9256	19.1067	19.4404	19.8891	20.2182	20.3589	20.3813	20.3790	20.2861	19.8544	19.3204	18.9034 (92)
Temperature adjustment	18.9256	19.1067	19.4404	19.8891	20.2182	20.3589	20.3813	20.3790	20.2861	19.8544	19.3204	18.9034 (93)
adjusted MIT	18.9256	19.1067	19.4404	19.8891	20.2182	20.3589	20.3813	20.3790	20.2861	19.8544	19.3204	18.9034 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	455.5957	510.1999	573.4353	627.7683	598.1993	445.5574	300.6375	313.7616	441.6855	468.5325	440.5200	434.8414	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1210.5949	1172.5718	1065.0682	892.5456	690.1263	461.1302	302.7778	317.9156	497.5932	749.7714	995.0887	1203.5901	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	561.7194	445.1140	365.7749	190.6396	68.3937	0.0000	0.0000	0.0000	0.0000	209.2417	399.2895	571.9490	(98)
Space heating												2812.1217	(98)
Space heating per m ²												38.6440	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3007.6168 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	561.7194	445.1140	365.7749	190.6396	68.3937	0.0000	0.0000	0.0000	0.0000	209.2417	399.2895	571.9490	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	600.7694	476.0577	391.2031	203.8927	73.1483	0.0000	0.0000	0.0000	0.0000	223.7879	427.0476	611.7102	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500	(64)
Efficiency of water heater (217)m	87.5117	87.2768	86.6980	85.2913	82.7787	79.8000	79.8000	79.8000	79.8000	85.4431	86.9514	87.6018	(216)
Fuel for water heating, kWh/month	219.3262	193.8683	205.0421	186.9491	188.8475	175.1642	168.3438	184.5636	184.1870	193.5056	200.9265	213.8656	(219)
Water heating fuel used												2314.5895	(219)
Annual totals kWh/year													
Space heating fuel - main system												3007.6168	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												328.1242	(232)
Total delivered energy for all uses												5725.3305	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3007.6168	0.2160	649.6452 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2314.5895	0.2160	499.9513 (264)
Space and water heating			1149.5966 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	328.1242	0.5190	170.2965 (268)
Total CO2, kg/m2/year			1358.8180 (272)
Emissions per m2 for space and water heating			15.7977 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3402 (272b)
Emissions per m2 for pumps and fans			0.5349 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.7977 * 1.00) + 2.3402 + 0.5349, rounded to 2 d.p.			18.6700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	130	Issued on Date	29/04/2022
Assessment Reference	130	Prop Type Ref	
Property			
SAP Rating	83 B	DER	17.33
Environmental	89 B	TER	18.68
CO ₂ Emissions (t/year)	0.75	% DER<TER	7.21
General Requirements Compliance	Pass	DFEE	38.80
		TFEE	42.54
		% DFEE<TFEE	8.81
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.68 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.33 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)42.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)38.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK
Based on:
Overshading: Average
Windows facing South East: 6.24 m², No overhang
Windows facing South: 2.21 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)
External Wall	23.1000	8.4500	14.6500	0.1500	2.1975		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Main Roof	50.7900		50.7900	0.1000	5.0790		(30)
Total net area of external elements Aum(A, m ²)			91.3900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.7446		(33)
Party Wall 1			33.8800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.4882 (36)
Total fabric heat loss							(33) + (36) = 31.2328 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	11.1341	11.0123	10.8905	10.2816	10.1599	9.5510	9.5510	9.4292	9.7945	10.1599	10.4034	10.6470 (38)
Average = Sum(39)m / 12 =	42.3669	42.2451	42.1233	41.5144	41.3926	40.7838	40.7838	40.6620	41.0273	41.3926	41.6362	41.8797 (39)
												41.4840 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8342	0.8318	0.8294	0.8174	0.8150	0.8030	0.8030	0.8006	0.8078	0.8150	0.8198	0.8246 (40)
Days in month												0.8168 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy content (annual)	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1178.3544 (45)
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)

Water storage loss:												
Store volume												
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												
Volume factor from Table 2a												
Temperature factor from Table 2b												
Enter (49) or (54) in (55)												
Total storage loss												110.0000 (47)
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
Solar input	177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921 (62)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) = Sum(63)m =				0.0000 (63)
Output from w/h	177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921 (64)
								Total per year (kWh/year) = Sum(64)m =				1829.1942 (64)
Heat gains from water heating, kWh/month												
	84.8430	75.4698	80.8830	74.7574	74.8902	69.2597	68.7450	72.3625	71.2721	77.4089	79.0216	83.5613 (65)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9851	0.9693	0.9347	0.8524	0.7037	0.5036	0.3505	0.3747	0.5881	0.8562	0.9656	0.9883 (94)
Useful gains	393.3825	434.3017	449.1835	425.8219	354.6490	244.4877	164.1587	171.7879	264.0226	361.7868	378.9436	376.5027 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	661.1352	640.9511	580.3497	480.8899	367.9875	245.7045	164.2477	171.9266	267.3893	409.8825	544.8386	656.4630 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	199.2081	138.8684	97.5876	39.6490	9.9238	0.0000	0.0000	0.0000	0.0000	35.7832	119.4444	208.2905 (98)
Space heating												848.7550 (98)
Space heating per m2												16.7111 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	848.7550 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	891.1928 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1920.6539 (310a)
Electricity used for heat distribution	28.1185 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	238.1302 (332)
Total delivered energy for all uses	3171.9681 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3141.7281	0.2160	678.6133 (367)
Electrical energy for heat distribution	28.1185	0.5190	14.5935 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			693.2068 (373)
Space and water heating			693.2068 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	238.1302	0.5190	123.5896 (379)
Total CO2, kg/year			880.1098 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			17.3300 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		17.3300 ZC1
Total Floor Area	TFA	50.7900
Assumed number of occupants	N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.4175 ZC2
CO2 emissions from cooking, equation (L16)		3.1526 ZC3
Total CO2 emissions		37.9001 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		37.9001 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) = 0.1575 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4075 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
Effective ac	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)
External Wall	23.1000	8.4500	14.6500	0.1800	2.6370		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Main Roof	50.7900		50.7900	0.1300	6.6027		(30)
Total net area of external elements Aum(A, m ²)			91.3900				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	25.1422	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.0180 (36)
Total fabric heat loss						(33) + (36) =	31.1602 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	24.3480	24.2160	24.0867	23.4794	23.3658	22.8368	22.8368	22.7389	23.0406	23.3658	23.5957	23.8360 (38)
Heat transfer coeff	55.5081	55.3762	55.2469	54.6396	54.5259	53.9970	53.9970	53.8990	54.2007	54.5259	54.7558	54.9961 (39)
Average = Sum(39)m / 12 =												54.6390 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0929	1.0903	1.0878	1.0758	1.0736	1.0631	1.0631	1.0612	1.0672	1.0736	1.0781	1.0828 (40)
HLP (average)												1.0758 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
Heat gains from water heating, kWh/month	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Southeast				6.2400	36.7938	0.6300	0.7000	0.7700	70.1668 (77)			
South				2.2100	46.7521	0.6300	0.7000	0.7700	31.5766 (78)			
Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains	421.2115	488.9806	537.3716	569.4289	581.3281	561.5651	541.7662	526.3621	510.2428	468.0154	419.7157	398.8747 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	63.5418	63.6931	63.8422	64.5518	64.6863	65.3200	65.3200	65.4387	65.0745	64.6863	64.4148	64.1333
alpha	5.2361	5.2462	5.2561	5.3035	5.3124	5.3547	5.3547	5.3626	5.3383	5.3124	5.2943	5.2756
util living area	0.9912	0.9802	0.9560	0.8970	0.7790	0.5970	0.4355	0.4666	0.6896	0.9103	0.9803	0.9932 (86)
MIT	20.0480	20.2293	20.4626	20.7181	20.8983	20.9806	20.9969	20.9956	20.9585	20.7355	20.3449	20.0120 (87)
Th 2	20.0066	20.0088	20.0108	20.0207	20.0225	20.0310	20.0310	20.0326	20.0277	20.0225	20.0188	20.0149 (88)
util rest of house	0.9884	0.9743	0.9429	0.8674	0.7225	0.5144	0.3412	0.3708	0.6088	0.8781	0.9734	0.9911 (89)
MIT 2	18.7600	19.0223	19.3541	19.7084	19.9297	20.0190	20.0300	20.0309	19.9985	19.7401	19.1987	18.7140 (90)
Living area fraction	19.4077	19.6293	19.9115	20.2162	20.4168	20.5025	20.5162	20.5160	20.4812	20.2407	19.7751	19.3667 (91)
MIT	19.4077	19.6293	19.9115	20.2162	20.4168	20.5025	20.5162	20.5160	20.4812	20.2407	19.7751	19.3667 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4077	19.6293	19.9115	20.2162	20.4168	20.5025	20.5162	20.5160	20.4812	20.2407	19.7751	19.3667 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9863	0.9715	0.9414	0.8739	0.7465	0.5554	0.3888	0.4191	0.6479	0.8861	0.9712	0.9892 (94)
Useful gains	415.4362	475.0404	505.8639	497.6041	433.9552	311.8915	210.6254	220.5971	330.5882	414.7289	407.6338	394.5855 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	838.5986	815.6512	740.9441	618.3098	475.2901	318.7174	211.4642	221.8502	345.8678	525.6658	694.0329	834.1115 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	314.8328	228.8905	174.8996	86.9081	30.7532	0.0000	0.0000	0.0000	0.0000	82.5370	206.2074	327.0073 (98)
Space heating												1452.0359 (98)
Space heating per m2										(98) / (4) =		28.5890 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1552.9796 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	314.8328	228.8905	174.8996	86.9081	30.7532	0.0000	0.0000	0.0000	0.0000	82.5370	206.2074	327.0073	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	336.7196	244.8026	187.0584	92.9499	32.8911	0.0000	0.0000	0.0000	0.0000	88.2749	220.5426	349.7404	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	86.4545	85.9567	85.1047	83.5639	81.5485	79.8000	79.8000	79.8000	79.8000	83.3528	85.5925	86.6070	(216)
Fuel for water heating, kWh/month	195.2067	173.2692	184.3087	168.9959	170.2445	156.2471	150.8144	164.4484	163.8315	175.6470	179.9739	190.4121	(219)
Water heating fuel used												2073.3994	(219)
Annual totals kWh/year													
Space heating fuel - main system												1552.9796	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												3944.7553	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1552.9796	0.2160	335.4436 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2073.3994	0.2160	447.8543 (264)
Space and water heating			783.2979 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			948.5352 (272)
Emissions per m2 for space and water heating			15.4223 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.4223 * 1.00) + 2.4870 + 0.7664, rounded to 2 d.p.			18.6800 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	131				Issued on Date	29/04/2022
Assessment Reference	131		Prop Type Ref			
Property						
SAP Rating	84 B	DER	15.76	TER	16.96	
Environmental	88 B	% DER<TER	7.08			
CO ₂ Emissions (t/year)	0.97	DFEE	39.48	TFEE	45.24	
General Requirements Compliance	Fail	% DFEE<TFEE	12.73			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 74 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 16.96 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.76 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)45.2 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)39.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system:	Community heating scheme	-

Secondary heating system:	None

5 Cylinder insulation

Hot water storage	No cylinder

6 Controls

Space heating controls:	Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:	No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.61	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley):	High	Fail

Based on:

Overshading:	Average
Windows facing South East:	6.24 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Windows facing South West:	9.35 m ² , No overhang
Windows facing West:	1.97 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												75.6500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			19.7700	1.1450	22.6374		(27)
External Wall	52.9500	19.7700	33.1800	0.1500	4.9770		(29a)
Corridor	5.4000	1.8900	3.5100	0.2500	0.8775		(29a)
Main Roof	73.5200		73.5200	0.1000	7.3520		(30)
Total net area of external elements Aum(A, m ²)			131.8700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	37.7339			(33)
Party Wall 1			34.8500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.0218 (36)
Total fabric heat loss							(33) + (36) = 49.7557 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	17.2447	17.0514	16.8580	15.8913	15.6980	14.7313	14.7313	14.5380	15.1180	15.6980	16.0847	16.4714 (38)
Heat transfer coeff	67.0004	66.8071	66.6137	65.6471	65.4537	64.4870	64.4870	64.2937	64.8737	65.4537	65.8404	66.2271 (39)
Average = Sum(39)m / 12 =												65.5987 (39)
HLP	0.9113	0.9087	0.9061	0.8929	0.8903	0.8771	0.8771	0.8745	0.8824	0.8903	0.8955	0.9008 (40)
HLP (average)												0.8923 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy content (annual)	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1408.1991 (45)
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	201.2769	177.6201	187.0442	168.3717	165.5050	148.6122	143.4181	156.4202	155.8451	174.5575	183.6979	196.6701	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
	Solar input (sum of months) = Sum (63)m =											0.0000 (63)	
Output from w/h													
	201.2769	177.6201	187.0442	168.3717	165.5050	148.6122	143.4181	156.4202	155.8451	174.5575	183.6979	196.6701	(64)
	Total per year (kWh/year) = Sum (64)m =											2059.0388 (64)	
Heat gains from water heating, kWh/month													
	92.7665	82.3997	88.0341	80.9919	80.8723	74.4219	73.5284	77.8516	76.8268	83.8823	86.0878	91.2347	(65)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1426.9750 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1498.3237 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2059.0388 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2161.9908 (310a)
Electricity used for heat distribution	36.6031 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	170.9800 (330a)
Total electricity for the above, kWh/year	170.9800 (331)
Electricity for lighting (calculated in Appendix L)	323.3395 (332)
Total delivered energy for all uses	4154.6339 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	4089.7369	0.2160	883.3832 (367)
Electrical energy for heat distribution	36.6031	0.5190	18.9970 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			902.3802 (373)
Space and water heating			902.3802 (376)
Pumps and fans	170.9800	0.5190	88.7386 (378)
Energy for lighting	323.3395	0.5190	167.8132 (379)
Total CO2, kg/year			1158.9320 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.7600 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		15.7600 ZC1
Total Floor Area	TFA	73.5200
Assumed number of occupants	N	2.3285
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.5530 ZC2
CO2 emissions from cooking, equation (L16)		2.3787 ZC3
Total CO2 emissions		34.6917 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		34.6917 ZC8

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					30.0000 / (5) = 0.1632 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4132 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3512 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4478	0.4390	0.4303	0.3864	0.3776	0.3337	0.3337	0.3249	0.3512	0.3776	0.3951	0.4127 (22b)
	0.6003	0.5964	0.5926	0.5746	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			16.4900	1.3258	21.8617		(27)
External Wall	52.9500	16.4900	36.4600	0.1800	6.5628		(29a)
Corridor	5.4000	1.8900	3.5100	0.1800	0.6318		(29a)
Main Roof	73.5200		73.5200	0.1300	9.5576		(30)
Total net area of external elements Aum(A, m ²)			131.8700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.5039		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.9698 (36)
Total fabric heat loss						(33) + (36) =	49.4737 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.4091	36.1729	35.9414	34.8541	34.6506	33.7036	33.7036	33.5282	34.0684	34.6506	35.0622	35.4924 (38)
Heat transfer coeff	85.8828	85.6466	85.4152	84.3278	84.1244	83.1773	83.1773	83.0020	83.5421	84.1244	84.5359	84.9662 (39)
Average = Sum(39)m / 12 =												84.3268 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1682	1.1649	1.1618	1.1470	1.1442	1.1314	1.1314	1.1290	1.1363	1.1442	1.1498	1.1557 (40)
HLP (average)												1.1470 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy content (annual)	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1408.1991 (45)
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
Heat gains from water heating, kWh/month	85.8210	76.1264	81.0886	74.2704	73.9268	67.7004	66.5829	70.9061	70.1053	76.9367	79.3664	84.2892 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3070	16.2601	13.2236	10.0111	7.4834	6.3178	6.8266	8.8735	11.9100	15.1225	17.6502	18.8158	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	(71)
Water heating gains (Table 5)	115.3508	113.2833	108.9900	103.1533	99.3640	94.0283	89.4931	95.3039	97.3685	103.4096	110.2311	113.2919	(72)
Total internal gains	399.9539	397.9707	385.2706	364.7888	344.0400	323.9750	310.8872	316.6137	327.0851	347.7714	371.5522	389.3425	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W			
Southeast				5.2100	36.7938	0.6300	0.7000	0.7700	58.5847 (77)			
South				1.8400	46.7521	0.6300	0.7000	0.7700	26.2900 (78)			
Southwest				7.8000	36.7938	0.6300	0.7000	0.7700	87.7085 (79)			
West				1.6400	19.6403	0.6300	0.7000	0.7700	9.8438 (80)			
Solar gains	182.4270	311.5043	427.5134	530.6984	594.4675	589.9567	568.8863	521.4963	463.3582	344.6994	218.6622	156.0085 (83)
Total gains	582.3809	709.4749	812.7841	895.4872	938.5075	913.9316	879.7735	838.1100	790.4433	692.4707	590.2145	545.3510 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.4479	59.6119	59.7734	60.5441	60.6906	61.3816	61.3816	61.5113	61.1135	60.6906	60.3951	60.0893	
alpha	4.9632	4.9741	4.9849	5.0363	5.0460	5.0921	5.0921	5.1008	5.0742	5.0460	5.0263	5.0060	
util living area	0.9932	0.9818	0.9542	0.8837	0.7506	0.5664	0.4132	0.4510	0.6826	0.9153	0.9841	0.9950	(86)
MIT	19.9104	20.1308	20.4099	20.7073	20.9004	20.9811	20.9968	20.9951	20.9528	20.6918	20.2409	19.8709	(87)
Th 2	19.9456	19.9481	19.9507	19.9626	19.9649	19.9753	19.9753	19.9772	19.9713	19.9649	19.9603	19.9556	(88)
util rest of house	0.9910	0.9763	0.9404	0.8509	0.6903	0.4826	0.3185	0.3531	0.5984	0.8834	0.9782	0.9934	(89)
MIT 2	18.5161	18.8357	19.2327	19.6427	19.8761	19.9639	19.9742	19.9754	19.9385	19.6351	19.0065	18.4661	(90)
Living area fraction									fLA = Living area / (4) =			0.3678	(91)
MIT	19.0289	19.3120	19.6657	20.0342	20.2528	20.3380	20.3503	20.3505	20.3115	20.0237	19.4605	18.9827	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0289	19.3120	19.6657	20.0342	20.2528	20.3380	20.3503	20.3505	20.3115	20.0237	19.4605	18.9827	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	575.6262	689.5468	760.6539	764.2527	664.5579	468.7698	310.9159	326.2264	496.0837	613.2181	575.1866	540.5815	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1264.9592	1234.3410	1124.5468	938.9269	719.5026	477.2745	311.9433	327.8964	518.9245	792.7668	1044.9078	1256.0330	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	512.8638	366.1017	270.7364	125.7655	40.8788	0.0000	0.0000	0.0000	0.0000	133.5842	338.1992	532.2959	(98)
Space heating												2320.4255	(98)
Space heating per m2										(98) / (4) =		31.5618	(99)

8c. Space cooling requirement

Not applicable

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												2481.7385 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	512.8638	366.1017	270.7364	125.7655	40.8788	0.0000	0.0000	0.0000	0.0000	133.5842	338.1992	532.2959 (98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000 (210)
Space heating fuel (main heating system)	548.5174	391.5527	289.5576	134.5085	43.7206	0.0000	0.0000	0.0000	0.0000	142.8708	361.7104	569.3004 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
Efficiency of water heater (217)m	87.3041	86.8121	85.9243	84.1807	81.7997	79.8000	79.8000	79.8000	79.8000	84.2431	86.5388	79.8000 (216)
Fuel for water heating, kWh/month	220.6024	195.5699	207.5807	190.0314	191.7158	175.7022	168.8423	185.1357	184.7660	196.9011	202.5635	214.9910 (219)
Water heating fuel used												2334.4022 (219)
Annual totals kWh/year												
Space heating fuel - main system												2481.7385 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												323.3067 (232)
Total delivered energy for all uses												5214.4474 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2481.7385	0.2160	536.0555 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2334.4022	0.2160	504.2309 (264)
Space and water heating			1040.2864 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	323.3067	0.5190	167.7962 (268)
Total CO2, kg/m2/year			1247.0076 (272)
Emissions per m2 for space and water heating			14.1497 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2823 (272b)
Emissions per m2 for pumps and fans			0.5294 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.1497 * 1.00) + 2.2823 + 0.5294, rounded to 2 d.p.			16.9600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	135	Issued on Date	29/04/2022
Assessment Reference	135	Prop Type Ref	
Property			
SAP Rating	84 B	DER	16.54
Environmental	89 B	TER	17.77
CO ₂ Emissions (t/year)	0.73	% DER<TER	6.91
General Requirements Compliance	Fail	DFEE	35.11
		TFEE	38.56
		% DFEE<TFEE	8.96
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 17.77 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.54 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)38.6 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)35.1 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing South East:	6.24 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Windows facing South West:	1.97 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			10.4200	1.1450	11.9313		(27)
External Wall	39.3500	10.4200	28.9300	0.1500	4.3395		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Total net area of external elements Aum(A, m ²)			56.8500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	22.0633	(33)
Party Wall 1			17.5500	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K												250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												7.2600 (36)
Total fabric heat loss												(33) + (36) = 29.3233 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	11.7351	11.6015	11.4680	10.8002	10.6666	9.9988	9.9988	9.8652	10.2659	10.6666	10.9337	11.2009 (38)
Average = Sum(39)m / 12 =	41.0584	40.9248	40.7913	40.1235	39.9899	39.3221	39.3221	39.1885	39.5892	39.9899	40.2570	40.5242 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8084	0.8058	0.8031	0.7900	0.7874	0.7742	0.7742	0.7716	0.7795	0.7874	0.7926	0.7979 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	30.9817	(56)
If cylinder contains dedicated solar storage													
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	30.9817	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	(59)
Total heat required for water heating calculated for each month													
177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	173.5921	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =													(63)
Output from w/h													
177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	173.5921	(64)
Heat gains from water heating, kWh/month													
84.8430	75.4698	80.8830	74.7574	74.8902	69.2597	68.7450	72.3625	71.2721	77.4089	79.0216	83.5613	83.5613	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
13.3089	11.8209	9.6134	7.2779	5.4403	4.5930	4.9629	6.4509	8.6584	10.9938	12.8314	13.6788	13.6788	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)													
114.0363	112.3063	108.7138	103.8297	100.6589	96.1941	92.3992	97.2615	98.9891	104.0442	109.7522	112.3135	112.3135	(72)
Total internal gains													
325.3314	323.6625	313.9587	298.4287	282.9297	267.7578	257.7459	262.5472	270.3860	286.0871	304.1233	317.3917	317.3917	(73)

6. Solar gains

[Jan]													
	Area	Solar flux	g	Specific data	FF	Access	Gains						
	m2	Table 6a	W/m2	or Table 6b	Specific data	factor	W						
					or Table 6c	Table 6d							
Southeast	6.2400	36.7938	0.4000		0.8000	0.7700	50.9147	(77)					
South	2.2100	46.7521	0.4000		0.8000	0.7700	22.9127	(78)					
Southwest	1.9700	36.7938	0.4000		0.8000	0.7700	16.0740	(79)					
Solar gains	89.9014	151.6316	203.9258	247.4718	272.9739	269.2882	260.3244	241.4662	218.9840	166.5863	107.3964	77.1270	(83)
Total gains	415.2328	475.2941	517.8846	545.9005	555.9036	537.0461	518.0703	504.0134	489.3700	452.6734	411.5197	394.5187	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	85.9040	86.1844	86.4666	87.9057	88.1993	89.6972	89.6972	90.0029	89.0920	88.1993	87.6141	87.0366	
alpha	6.7269	6.7456	6.7644	6.8604	6.8800	6.9798	6.9798	7.0002	6.9395	6.8800	6.8409	6.8024	
util living area	0.9862	0.9666	0.9213	0.8162	0.6545	0.4673	0.3339	0.3575	0.5538	0.8332	0.9645	0.9896	(86)
MIT	20.4554	20.6064	20.7743	20.9210	20.9840	20.9987	20.9999	20.9998	20.9958	20.9233	20.6783	20.4262	(87)
Th 2	20.2461	20.2483	20.2506	20.2620	20.2643	20.2757	20.2757	20.2780	20.2712	20.2643	20.2597	20.2552	(88)
util rest of house													
	0.9824	0.9581	0.9032	0.7823	0.6075	0.4150	0.2790	0.3015	0.4972	0.7947	0.9540	0.9866	(89)
MIT 2	19.5333	19.7491	19.9813	20.1785	20.2504	20.2749	20.2757	20.2780	20.2683	20.1868	19.8623	19.4988	(90)
Living area fraction													
MIT	19.9970	20.1802	20.3801	20.5519	20.6193	20.6389	20.6399	20.6410	20.6341	20.5572	20.2726	19.9651	(91)
Temperature adjustment													
adjusted MIT	19.9970	20.1802	20.3801	20.5519	20.6193	20.6389	20.6399	20.6410	20.6341	20.5572	20.2726	19.9651	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9809	0.9572	0.9066	0.7961	0.6304	0.4413	0.3066	0.3297	0.5256	0.8107	0.9542	0.9853	(94)
Useful gains	407.2926	454.9457	469.5068	434.6035	350.4570	237.0148	158.8272	166.1496	257.2094	367.0020	392.6747	388.6999	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
644.4942	625.3415	566.1862	467.5134	356.6811	237.4604	158.8559	166.1969	258.6802	398.1858	530.2911	638.8693	638.8693	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
176.4780	114.5060	71.9295	23.6952	4.6308	0.0000	0.0000	0.0000	0.0000	23.2007	99.0838	186.1261	186.1261	(98)
Space heating													
Space heating per m2													
													(98) / (4) = 13.7753 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	699.6500 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	734.6539 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1920.6539 (310a)
Electricity used for heat distribution	26.5529 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	235.0396 (332)
Total delivered energy for all uses	3012.3172 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	2966.8004	0.2160	640.8289 (367)
Electrical energy for heat distribution	26.5529	0.5190	13.7809 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			654.6098 (373)
Space and water heating			654.6098 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	235.0396	0.5190	121.9856 (379)
Total CO2, kg/year			839.9088 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			16.5400 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		16.5400 ZC1
Total Floor Area	TFA	50.7900
Assumed number of occupants	N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.4175 ZC2
CO2 emissions from cooking, equation (L16)		3.1526 ZC3
Total CO2 emissions		37.1101 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		37.1101 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					20.0000 / (5) = 0.1575 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4075 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3464 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4416	0.4330	0.4243	0.3810	0.3724	0.3291	0.3291	0.3204	0.3464	0.3724	0.3897	0.4070 (22b)
	0.5975	0.5937	0.5900	0.5726	0.5693	0.5541	0.5541	0.5513	0.5600	0.5693	0.5759	0.5828 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			10.4200	1.3258	13.8144		(27)					
External Wall	39.3500	10.4200	28.9300	0.1800	5.2074		(29a)					
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)					
Total net area of external elements Aum(A, m2)			56.8500				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	23.7216	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.5976 (36)					
Total fabric heat loss						(33) + (36) =	29.3192 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	25.0373	24.8786	24.7230	23.9925	23.8558	23.2195	23.2195	23.1017	23.4646	23.8558	24.1323	24.4214 (38)
Heat transfer coeff	54.3565	54.1978	54.0422	53.3117	53.1750	52.5387	52.5387	52.4209	52.7838	53.1750	53.4515	53.7406 (39)
Average = Sum(39)m / 12 =												53.3110 (39)
HLP	1.0702	1.0671	1.0640	1.0496	1.0470	1.0344	1.0344	1.0321	1.0393	1.0470	1.0524	1.0581 (40)
HLP (average)												1.0496 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.3700	11.8751	9.6575	7.3113	5.4653	4.6140	4.9856	6.4805	8.6981	11.0443	12.8903	13.7416	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.0571	317.3814	307.6675	292.1267	276.6192	261.4435	251.4333	256.2414	264.0903	279.8021	297.8468	311.1191	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
Southeast					6.2400	36.7938	0.6300	0.7000			0.7700			70.1668 (77)
South					2.2100	46.7521	0.6300	0.7000			0.7700			31.5766 (78)
Southwest					1.9700	36.7938	0.6300	0.7000			0.7700			22.1520 (79)
Solar gains	123.8953	208.9673	281.0353	341.0471	376.1922	371.1129	358.7596	332.7706	301.7873	229.5768	148.0056	106.2907	(83)	
Total gains	442.9525	526.3487	588.7027	633.1738	652.8114	632.5564	610.1929	589.0120	565.8776	509.3789	445.8524	417.4098	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	64.8880	65.0780	65.2653	66.1597	66.3297	67.1330	67.1330	67.2839	66.8213	66.3297	65.9866	65.6316	
alpha	5.3259	5.3385	5.3510	5.4106	5.4220	5.4755	5.4755	5.4856	5.4548	5.4220	5.3991	5.3754	
util living area	0.9887	0.9722	0.9357	0.8518	0.7085	0.5236	0.3777	0.4076	0.6216	0.8768	0.9736	0.9914 (86)	
MIT	20.1184	20.3225	20.5628	20.8008	20.9397	20.9905	20.9987	20.9980	20.9765	20.7995	20.4185	20.0804 (87)	
Th 2	20.0252	20.0278	20.0303	20.0422	20.0444	20.0547	20.0547	20.0567	20.0507	20.0444	20.0399	20.0352 (88)	
util rest of house	0.9852	0.9642	0.9183	0.8159	0.6504	0.4498	0.2972	0.3250	0.5449	0.8382	0.9647	0.9888 (89)	
MIT 2	18.8755	19.1689	19.5059	19.8286	19.9916	20.0490	20.0543	20.0559	20.0348	19.8368	19.3187	18.8281 (90)	
Living area fraction	19.5005	19.7489	20.0373	20.3175	20.4684	20.5224	20.5292	20.5296	20.5083	20.3209	19.8717	19.4578 (92)	
MIT	19.5005	19.7489	20.0373	20.3175	20.4684	20.5224	20.5292	20.5296	20.5083	20.3209	19.8717	19.4578 (93)	
Temperature adjustment												0.0000	
adjusted MIT	19.5005	19.7489	20.0373	20.3175	20.4684	20.5224	20.5292	20.5296	20.5083	20.3209	19.8717	19.4578 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9829	0.9615	0.9184	0.8269	0.6770	0.4867	0.3377	0.3666	0.5827	0.8504	0.9628	0.9868 (94)
Useful gains	435.3792	506.1019	540.6757	523.5667	441.9757	307.8751	206.0715	215.9135	329.7317	433.1813	429.2618	411.8986 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	826.2463	804.7800	731.5873	608.6836	466.2587	311.1577	206.4334	216.4791	338.2567	516.9074	682.6690	819.9635 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	290.8052	200.7117	142.0383	61.2841	18.0665	0.0000	0.0000	0.0000	0.0000	62.2922	182.4532	303.6003 (98)
Space heating												1261.2515 (98)
Space heating per m2												24.8327 (99)
										(98) / (4) =		

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1348.9321 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	290.8052	200.7117	142.0383	61.2841	18.0665	0.0000	0.0000	0.0000	0.0000	62.2922	182.4532	303.6003	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	311.0216	214.6649	151.9126	65.5445	19.3225	0.0000	0.0000	0.0000	0.0000	66.6227	195.1371	324.7062	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	86.2530	85.6104	84.5505	82.7613	80.9014	79.8000	79.8000	79.8000	79.8000	82.7191	85.2662	79.8000	(216)
Fuel for water heating, kWh/month	195.6629	173.9702	185.5167	170.6349	171.6061	156.2471	150.8144	164.4484	163.8315	176.9926	180.6628	190.8214	(219)
Water heating fuel used												2081.2089	(219)
Annual totals kWh/year													
Space heating fuel - main system												1348.9321	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												236.1179	(232)
Total delivered energy for all uses												3741.2589	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1348.9321	0.2160	291.3693 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2081.2089	0.2160	449.5411 (264)
Space and water heating			740.9105 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	236.1179	0.5190	122.5452 (268)
Total CO2, kg/m2/year			902.3806 (272)
Emissions per m2 for space and water heating			14.5877 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4128 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.5877 * 1.00) + 2.4128 + 0.7664, rounded to 2 d.p.			17.7700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	136	Issued on Date	29/04/2022
Assessment Reference	136	Prop Type Ref	
Property			
SAP Rating	83 B	DER	17.64
Environmental	87 B	TER	19.13
CO ₂ Emissions (t/year)	1.04	% DER<TER	7.80
General Requirements Compliance	Pass	DFEE	47.30
		TFEE	55.17
		% DFEE<TFEE	14.26
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 19.13 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.64 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)55.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)47.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK
Based on:
Overshading: Average
Windows facing North: 5.88 m², No overhang
Windows facing North West: 7.07 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							2	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1275 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			12.9500	1.1450	14.8282		(27)					
External Wall	35.0800	12.9500	22.1300	0.1500	3.3195		(29a)					
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)					
Core	18.2300		18.2300	0.2500	4.5575		(29a)					
Main Roof	72.7700		72.7700	0.1000	7.2770		(30)					
Total net area of external elements Aum(A, m2)			143.5800				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		35.7747		(33)					
Party Wall 1			18.3000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.2124 (36)					
Total fabric heat loss							(33) + (36) = 45.9871 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 17.0688	Feb 16.8774	Mar 16.6860	Apr 15.7292	May 15.5379	Jun 14.5811	Jul 14.5811	Aug 14.3897	Sep 14.9638	Oct 15.5379	Nov 15.9206	Dec 16.3033 (38)
Heat transfer coeff	63.0559	62.8646	62.6732	61.7164	61.5250	60.5682	60.5682	60.3768	60.9509	61.5250	61.9077	62.2905 (39)
Average = Sum(39)m / 12 =												61.6685 (39)
HLP	Jan 0.8665	Feb 0.8639	Mar 0.8613	Apr 0.8481	May 0.8455	Jun 0.8323	Jul 0.8323	Aug 0.8297	Sep 0.8376	Oct 0.8455	Nov 0.8507	Dec 0.8560 (40)
HLP (average)												0.8474 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	Jan 98.0067	Feb 94.4428	Mar 90.8789	Apr 87.3151	May 83.7512	Jun 80.1873	Jul 80.1873	Aug 83.7512	Sep 87.3151	Oct 90.8789	Nov 94.4428	Dec 98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)												Total = Sum(45)m = 1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)
Water storage loss:											
Store volume											110.0000 (47)
b) If manufacturer declared loss factor is not known :											
Hot water storage loss factor from Table 2 (kWh/litre/day)											0.0152 (51)
Volume factor from Table 2a											1.0294 (52)
Temperature factor from Table 2b											0.6000 (53)
Enter (49) or (54) in (55)											1.0327 (55)
Total storage loss											
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage											
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month											
200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =											0.0000 (63)
Output from w/h											
200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319 (64)
Total per year (kWh/year) = Sum(64)m =											2052.6825 (64)
Heat gains from water heating, kWh/month											
92.5474	82.2081	87.8363	80.8195	80.7069	74.2791	73.3961	77.6998	76.6732	83.7032	85.8924	91.0225 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5											
18.2553	16.2142	13.1863	9.9829	7.4623	6.3000	6.8074	8.8485	11.8764	15.0798	17.6004	18.7627 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											
203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573 (69)
Pumps, fans											
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)											
-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581 (71)
Water heating gains (Table 5)											
124.3916	122.3335	118.0596	112.2492	108.4770	103.1654	98.6507	104.4353	106.4905	112.5044	119.2950	122.3421 (72)
Total internal gains											
403.9925	402.0068	389.3790	369.0270	348.4216	328.4959	315.5019	321.2141	331.6232	352.1788	375.8026	393.4637 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
	m2	Table 6a	Specific data	Specific data	factor	W
		W/m2	or Table 6b	or Table 6c	Table 6d	
North	5.8800	10.6334	0.4000	0.8000	0.7700	13.8654 (74)
Northwest	7.0700	11.2829	0.4000	0.8000	0.7700	17.6899 (81)
Solar gains						
31.5553	62.5058	109.9012	178.8670	240.6417	256.9805	240.2068
Total gains						
435.5478	464.5125	499.2802	547.8939	589.0632	585.4764	555.7088

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)											
Utilisation factor for gains for living area, nil,m (see Table 9a)											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	80.1427	80.3867	80.6321	81.8822	82.1369	83.4344	83.4344	83.6988	82.9105	82.1369	81.6291
alpha	6.3428	6.3591	6.3755	6.4588	6.4758	6.5623	6.5623	6.5799	6.5274	6.4758	6.4419
util living area	0.9978	0.9962	0.9900	0.9600	0.8533	0.6465	0.4776	0.5376	0.8201	0.9743	0.9952
MIT											
20.1584	20.2520	20.4354	20.6985	20.9050	20.9875	20.9985	20.9969	20.9461	20.6951	20.3894	20.1440 (87)
Th 2	20.1961	20.1983	20.2006	20.2118	20.2141	20.2254	20.2254	20.2277	20.2209	20.2141	20.2096
util rest of house	0.9971	0.9949	0.9866	0.9462	0.8104	0.5749	0.3946	0.4498	0.7560	0.9628	0.9934
MIT 2	19.0639	19.2021	19.4701	19.8524	20.1212	20.2171	20.2248	20.2263	20.1774	19.8545	19.4116
Living area fraction											
MIT	19.4849	19.6059	19.8414	20.1778	20.4227	20.5134	20.5224	20.5227	20.4731	20.1778	19.7877
Temperature adjustment											
adjusted MIT	19.4849	19.6059	19.8414	20.1778	20.4227	20.5134	20.5224	20.5227	20.4731	20.1778	19.7877

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9963	0.9937	0.9846	0.9455	0.8227	0.6021	0.4266	0.4837	0.7783	0.9621	0.9922
Useful gains	433.9373	461.5895	491.5960	518.0235	484.6082	352.4973	237.0559	247.8034	361.7563	411.5249	411.9177
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000
Heat loss rate W											
957.4952	924.4807	836.1487	696.0249	536.6613	358.1638	237.5717	248.9156	388.4460	589.2752	785.4672	951.2177 (97)
Month fracti											
1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh											
389.5271	311.0629	256.3472	128.1610	38.7275	0.0000	0.0000	0.0000	0.0000	132.2462	268.9557	396.5414 (98)
Space heating											
Space heating per m2											
(98) / (4) =											26.4061 (99)

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Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	1921.5691	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	2017.6475	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating:		
Annual water heating requirement	2052.6825	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2155.3166	(310a)
Electricity used for heat distribution	41.7296	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)		
mechanical ventilation fans (SFP = 0.7625)	169.2357	(330a)
Total electricity for the above, kWh/year	169.2357	(331)
Electricity for lighting (calculated in Appendix L)	322.3944	(332)
Total delivered energy for all uses	4664.5942	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	4662.5297	0.2160	1007.1064 (367)
Electrical energy for heat distribution	41.7296	0.5190	21.6577 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1028.7641 (373)
Space and water heating			1028.7641 (376)
Pumps and fans	169.2357	0.5190	87.8333 (378)
Energy for lighting	322.3944	0.5190	167.3227 (379)
Total CO2, kg/year			1283.9201 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			17.6400 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		17.6400	ZC1
Total Floor Area	TFA	72.7700	
Assumed number of occupants	N	2.3115	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.5855	ZC2
CO2 emissions from cooking, equation (L16)		2.3976	ZC3
Total CO2 emissions		36.6231	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		36.6231	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1649 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4149 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3527 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4497	0.4408	0.4320	0.3879	0.3791	0.3350	0.3350	0.3262	0.3527	0.3791	0.3968	0.4144 (22b)
Effective ac	0.6011	0.5972	0.5933	0.5752	0.5719	0.5561	0.5561	0.5532	0.5622	0.5719	0.5787	0.5859 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			12.9500	1.3258	17.1686		(27)					
External Wall	35.0800	12.9500	22.1300	0.1800	3.9834		(29a)					
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)					
Core	18.2300		18.2300	0.1800	3.2814		(29a)					
Main Roof	72.7700		72.7700	0.1300	9.4601		(30)					
Total net area of external elements Aum(A, m2)			143.5800				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	38.5933		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.0924 (36)					
Total fabric heat loss						(33) + (36) =	46.6857 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 36.0868	Feb 35.8511	Mar 35.6201	Apr 34.5351	May 34.3321	Jun 33.3870	Jul 33.3870	Aug 33.2120	Sep 33.7511	Oct 34.3321	Nov 34.7427	Dec 35.1721 (38)
Heat transfer coeff	82.7724	82.5368	82.3058	81.2207	81.0177	80.0727	80.0727	79.8977	80.4367	81.0177	81.4284	81.8577 (39)
Average = Sum(39)m / 12 =												81.2198 (39)
HLP	Jan 1.1375	Feb 1.1342	Mar 1.1310	Apr 1.1161	May 1.1133	Jun 1.1004	Jul 1.1004	Aug 1.0979	Sep 1.1054	Oct 1.1133	Nov 1.1190	Dec 1.1249 (40)
HLP (average)												1.1161 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)										Total = Sum(45)m =		1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												
21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133	(46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

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Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (64)
Heat gains from water heating, kWh/month	85.6018	75.9347	80.8908	74.0980	73.7613	67.5576	66.4506	70.7543	69.9517	76.7577	79.1709	84.0770 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5798	16.5024	13.4206	10.1603	7.5949	6.4120	6.9283	9.0057	12.0875	15.3478	17.9132	19.0961	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	(71)
Water heating gains (Table 5)	115.0562	112.9981	108.7242	102.9139	99.1416	93.8300	89.3153	95.0999	97.1551	103.1690	109.9597	113.0067	(72)
Total internal gains	397.9816	395.9596	383.2780	362.8690	342.2188	322.2725	309.2875	315.0360	325.4989	346.1114	369.7800	387.4618	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W	
North					5.8800	10.6334	0.6300	0.7000			0.7700	19.1083	(74)
Northwest					7.0700	11.2829	0.6300	0.7000			0.7700	24.3789	(81)
Solar gains	43.4871	86.1407	151.4575	246.5010	331.6343	354.1512	331.0351	263.3898	183.5487	104.1129	54.2474	35.8386	(83)
Total gains	441.4687	482.1003	534.7355	609.3700	673.8531	676.4237	640.3226	578.4258	509.0476	450.2243	424.0274	423.3004	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.0526	61.2269	61.3988	62.2190	62.3749	63.1110	63.1110	63.2493	62.8254	62.3749	62.0603	61.7348
alpha	5.0702	5.0818	5.0933	5.1479	5.1583	5.2074	5.2074	5.2166	5.1884	5.1583	5.1374	5.1157
util living area	0.9979	0.9963	0.9907	0.9657	0.8806	0.7049	0.5389	0.6123	0.8724	0.9812	0.9960	0.9983 (86)
MIT	19.7818	19.9018	20.1405	20.4880	20.7920	20.9536	20.9906	20.9826	20.8556	20.4792	20.0791	19.7649 (87)
Th 2	19.9704	19.9730	19.9756	19.9877	19.9900	20.0005	20.0005	20.0025	19.9965	19.9900	19.9854	19.9806 (88)
util rest of house	0.9972	0.9950	0.9872	0.9524	0.8362	0.6154	0.4224	0.4910	0.8074	0.9716	0.9943	0.9978 (89)
MIT 2	18.3470	18.5240	18.8731	19.3787	19.7842	19.9697	19.9971	19.9952	19.8758	19.3747	18.7923	18.3296 (90)
Living area fraction	18.8989	19.0539	19.3606	19.8054	20.1718	20.3481	20.3792	20.3750	20.2527	19.7996	19.2872	18.8817 (91)
MIT	18.8989	19.0539	19.3606	19.8054	20.1718	20.3481	20.3792	20.3750	20.2527	19.7996	19.2872	18.8817 (92)
Temperature adjustment	18.8989	19.0539	19.3606	19.8054	20.1718	20.3481	20.3792	20.3750	20.2527	19.7996	19.2872	18.8817 (93)
adjusted MIT	18.8989	19.0539	19.3606	19.8054	20.1718	20.3481	20.3792	20.3750	20.2527	19.7996	19.2872	18.8817 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	439.7658	478.9334	526.4371	578.5506	569.5578	438.4616	299.3588	311.1597	420.6591	436.3651	420.9333	421.9807	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1208.3850	1168.2182	1058.5024	885.7417	686.3676	460.2677	302.6105	317.5904	494.9028	745.3267	992.3853	1201.8094	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	571.8527	463.1994	395.8565	221.1776	86.9065	0.0000	0.0000	0.0000	0.0000	229.8674	411.4455	580.1925	(98)
Space heating												2960.4981	(98)
Space heating per m ²												40.6829	(99)

8c. Space cooling requirement

Not applicable

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9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3166.3081 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	571.8527	463.1994	395.8565	221.1776	86.9065	0.0000	0.0000	0.0000	0.0000	229.8674	411.4455	580.1925	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	611.6072	495.4004	423.3760	236.5536	92.9481	0.0000	0.0000	0.0000	0.0000	245.8475	440.0486	620.5267	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500	(64)
Efficiency of water heater (217)m	87.5500	87.3657	86.8895	85.6869	83.3198	79.8000	79.8000	79.8000	79.8000	85.6930	87.0221	87.6319	(216)
Fuel for water heating, kWh/month	219.2301	193.6708	204.5904	186.0859	187.6211	175.1642	168.3438	184.5636	184.1870	192.9413	200.7631	213.7920	(219)
Water heating fuel used												2310.9534	(219)
Annual totals kWh/year													
Space heating fuel - main system												3166.3081	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												328.1242	(232)
Total delivered energy for all uses												5880.3857	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3166.3081	0.2160	683.9226 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2310.9534	0.2160	499.1659 (264)
Space and water heating			1183.0885 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	328.1242	0.5190	170.2965 (268)
Total CO2, kg/m2/year			1392.3100 (272)
Emissions per m2 for space and water heating			16.2579 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3402 (272b)
Emissions per m2 for pumps and fans			0.5349 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.2579 * 1.00) + 2.3402 + 0.5349, rounded to 2 d.p.			19.1300 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	137			Issued on Date	29/04/2022
Assessment Reference	137	Prop Type Ref			
Property					
SAP Rating	84 B	DER	16.35	TER	17.85
Environmental	88 B	% DER<TER	8.42		
CO ₂ Emissions (t/year)	0.99	DFEE	42.21	TFEE	49.77
General Requirements Compliance	Fail	% DFEE<TFEE	15.20		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 74 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 17.85 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.35 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)49.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)42.2 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.61	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing North:	1.97 m ² , No overhang
Windows facing North East:	6.47 m ² , No overhang
Windows facing East:	2.21 m ² , No overhang
Windows facing South East:	6.24 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												75.6500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			16.8900	1.1450	19.3397		(27)
External Wall	49.6500	16.8900	32.7600	0.1500	4.9140		(29a)
Corridor	4.5800	1.8900	2.6900	0.2500	0.6725		(29a)
Main Roof	73.5200		73.5200	0.1000	7.3520		(30)
Total net area of external elements Aum(A, m ²)				127.7500			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.1682		(33)
Party Wall 1			38.0500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.8310 (36)
Total fabric heat loss							(33) + (36) = 45.9992 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	17.2447	17.0514	16.8580	15.8913	15.6980	14.7313	14.7313	14.5380	15.1180	15.6980	16.0847	16.4714 (38)
Average = Sum(39)m / 12 =	63.2439	63.0506	62.8572	61.8905	61.6972	60.7305	60.7305	60.5372	61.1172	61.6972	62.0839	62.4705 (39)
												61.8422 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8602	0.8576	0.8550	0.8418	0.8392	0.8260	0.8260	0.8234	0.8313	0.8392	0.8444	0.8497 (40)
Days in month												0.8412 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												
Average daily hot water use (litres/day)												2.3285 (42)
												89.5010 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy content (annual)	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1408.1991 (45)
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1592.7645 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1672.4028 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2059.0388 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2161.9908 (310a)
Electricity used for heat distribution	38.3439 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	170.9800 (330a)
Total electricity for the above, kWh/year	170.9800 (331)
Electricity for lighting (calculated in Appendix L)	323.3395 (332)
Total delivered energy for all uses	4328.7130 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	4284.2386	0.2160	925.3955 (367)
Electrical energy for heat distribution	38.3439	0.5190	19.9005 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			945.2960 (373)
Space and water heating			945.2960 (376)
Pumps and fans	170.9800	0.5190	88.7386 (378)
Energy for lighting	323.3395	0.5190	167.8132 (379)
Total CO2, kg/year			1201.8478 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			16.3500 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		16.3500 ZC1
Total Floor Area	TFA	73.5200
Assumed number of occupants	N	2.3285
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.5530 ZC2
CO2 emissions from cooking, equation (L16)		2.3787 ZC3
Total CO2 emissions		35.2817 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		35.2817 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					30.0000 / (5) = 0.1632 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4132 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3512 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4478	0.4390	0.4303	0.3864	0.3776	0.3337	0.3337	0.3249	0.3512	0.3776	0.3951	0.4127 (22b)
	0.6003	0.5964	0.5926	0.5746	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			16.4900	1.3258	21.8617		(27)
External Wall	49.6500	16.4900	33.1600	0.1800	5.9688		(29a)
Corridor	4.5800	1.8900	2.6900	0.1800	0.4842		(29a)
Main Roof	73.5200		73.5200	0.1300	9.5576		(30)
Total net area of external elements Aum(A, m ²)			127.7500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	39.7623	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.5999 (36)
Total fabric heat loss						(33) + (36) =	48.3622 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.4091	36.1729	35.9414	34.8541	34.6506	33.7036	33.7036	33.5282	34.0684	34.6506	35.0622	35.4924 (38)
Heat transfer coeff	84.7713	84.5351	84.3037	83.2163	83.0129	82.0658	82.0658	81.8905	82.4306	83.0129	83.4244	83.8547 (39)
Average = Sum(39)m / 12 =												83.2153 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1530	1.1498	1.1467	1.1319	1.1291	1.1162	1.1162	1.1139	1.1212	1.1291	1.1347	1.1406 (40)
HLP (average)												1.1319 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy content (annual)	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1408.1991 (45)
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
Heat gains from water heating, kWh/month	85.8210	76.1264	81.0886	74.2704	73.9268	67.7004	66.5829	70.9061	70.1053	76.9367	79.3664	84.2892 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3070	16.2601	13.2236	10.0111	7.4834	6.3178	6.8266	8.8735	11.9100	15.1225	17.6502	18.8158	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	(71)
Water heating gains (Table 5)	115.3508	113.2833	108.9900	103.1533	99.3640	94.0283	89.4931	95.3039	97.3685	103.4096	110.2311	113.2919	(72)
Total internal gains	399.9539	397.9707	385.2706	364.7888	344.0400	323.9750	310.8872	316.6137	327.0851	347.7714	371.5522	389.3425	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d	Gains W		
North				1.9200	10.6334	0.6300	0.7000		0.7700	6.2394 (74)		
Northeast				6.3200	11.2829	0.6300	0.7000		0.7700	21.7927 (75)		
East				2.1600	19.6403	0.6300	0.7000		0.7700	12.9650 (76)		
Southeast				6.0900	36.7938	0.6300	0.7000		0.7700	68.4801 (77)		
Solar gains	109.4772	198.2928	301.5531	422.4704	516.4299	531.3511	504.5419	431.8290	343.1398	227.4190	133.3072	92.2650 (83)
Total gains	509.4312	596.2635	686.8237	787.2591	860.4699	855.3261	815.4291	748.4428	670.2249	575.1904	504.8594	481.6075 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.2274	60.3957	60.5615	61.3528	61.5032	62.2129	62.2129	62.3462	61.9376	61.5032	61.1998	60.8858	
alpha	5.0152	5.0264	5.0374	5.0902	5.1002	5.1475	5.1475	5.1564	5.1292	5.1002	5.0800	5.0591	
util living area	0.9962	0.9911	0.9752	0.9197	0.7876	0.5938	0.4391	0.4959	0.7614	0.9541	0.9917	0.9971	(86)
MIT	19.8405	20.0163	20.2937	20.6375	20.8791	20.9777	20.9961	20.9929	20.9249	20.5966	20.1559	19.8118	(87)
Th 2	19.9578	19.9603	19.9629	19.9749	19.9771	19.9876	19.9876	19.9895	19.9836	19.9771	19.9726	19.9678	(88)
util rest of house	0.9949	0.9881	0.9670	0.8940	0.7301	0.5084	0.3400	0.3908	0.6795	0.9337	0.9884	0.9962	(89)
MIT 2	18.4235	18.6807	19.0814	19.5661	19.8666	19.9739	19.9862	19.9868	19.9279	19.5239	18.8940	18.3889	(90)
Living area fraction									fLA = Living area / (4) =			0.3678	(91)
MIT	18.9447	19.1719	19.5273	19.9601	20.2390	20.3431	20.3576	20.3568	20.2946	19.9184	19.3581	18.9123	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9447	19.1719	19.5273	19.9601	20.2390	20.3431	20.3576	20.3568	20.2946	19.9184	19.3581	18.9123	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9932	0.9851	0.9626	0.8936	0.7459	0.5392	0.3766	0.4296	0.7064	0.9323	0.9858	0.9948	(94)
Useful gains	505.9666	587.4086	661.1294	703.5102	641.8261	461.2074	307.0859	321.5623	473.4763	536.2560	497.6762	479.0810	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1241.4474	1206.4763	1098.2479	920.3844	708.8440	471.3116	308.3742	324.0282	510.6249	773.5486	1022.6271	1233.6911	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	547.1977	416.0135	325.2162	156.1494	49.8613	0.0000	0.0000	0.0000	0.0000	176.5457	377.9647	561.4300	(98)
Space heating												2610.3784	(98)
Space heating per m2										(98) / (4) =		35.5057	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												2791.8486 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	547.1977	416.0135	325.2162	156.1494	49.8613	0.0000	0.0000	0.0000	0.0000	176.5457	377.9647	561.4300 (98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000 (210)
Space heating fuel (main heating system)	585.2382	444.9342	347.8248	167.0047	53.3276	0.0000	0.0000	0.0000	0.0000	188.8189	404.2403	600.4599 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
Efficiency of water heater (217)m	87.4474	87.1146	86.3969	84.7495	82.1429	79.8000	79.8000	79.8000	79.8000	84.9802	86.8119	79.8000 (216)
Fuel for water heating, kWh/month	220.2409	194.8908	206.4453	188.7561	190.9148	175.7022	168.8423	185.1357	184.7660	195.1931	201.9263	214.7084 (219)
Water heating fuel used												2327.5220 (219)
Annual totals kWh/year												
Space heating fuel - main system												2791.8486 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												323.3067 (232)
Total delivered energy for all uses												5517.6773 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2791.8486	0.2160	603.0393 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2327.5220	0.2160	502.7447 (264)
Space and water heating			1105.7840 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	323.3067	0.5190	167.7962 (268)
Total CO2, kg/m2/year			1312.5052 (272)
Emissions per m2 for space and water heating			15.0406 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2823 (272b)
Emissions per m2 for pumps and fans			0.5294 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.0406 * 1.00) + 2.2823 + 0.5294, rounded to 2 d.p.			17.8500 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	138	Issued on Date	29/04/2022
Assessment Reference	138	Prop Type Ref	
Property			
SAP Rating	83 B	DER	17.21
Environmental	89 B	TER	18.50
CO ₂ Emissions (t/year)	0.75	% DER<TER	6.98
General Requirements Compliance	Pass	DFEE	38.30
		TFEE	41.63
		% DFEE<TFEE	8.00
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 18.50 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.21 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)41.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)38.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK
Based on:
Overshading: Average
Windows facing South East: 6.24 m², No overhang
Windows facing South: 2.21 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)
External Wall	19.8500	8.4500	11.4000	0.1500	1.7100		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Main Roof	50.7900		50.7900	0.1000	5.0790		(30)
Total net area of external elements Aum(A, m ²)			88.1400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	22.2571			(33)
Party Wall 1			37.0000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.5542 (36)
Total fabric heat loss							(33) + (36) = 30.8113 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	11.1341	11.0123	10.8905	10.2816	10.1599	9.5510	9.5510	9.4292	9.7945	10.1599	10.4034	10.6470 (38)
Heat transfer coeff	41.9454	41.8236	41.7018	41.0929	40.9711	40.3623	40.3623	40.2405	40.6058	40.9711	41.2147	41.4582 (39)
Average = Sum(39)m / 12 =												41.0625 (39)
HLP	0.8259	0.8235	0.8211	0.8091	0.8067	0.7947	0.7947	0.7923	0.7995	0.8067	0.8115	0.8163 (40)
HLP (average)												0.8085 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)

Water storage loss:												110.0000	(47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)	
If cylinder contains dedicated solar storage													
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)	
Total heat required for water heating calculated for each month													
177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(62)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)	
Solar input (sum of months) = Sum(63)m =												0.0000	(63)
Output from w/h													
177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(64)	
Total per year (kWh/year) = Sum(64)m =												1829.1942	(64)
Heat gains from water heating, kWh/month													
84.8430	75.4698	80.8830	74.7574	74.8902	69.2597	68.7450	72.3625	71.2721	77.4089	79.0216	83.5613	(65)	

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.4839	11.9763	9.7398	7.3736	5.5119	4.6534	5.0281	6.5357	8.7723	11.1384	13.0002	13.8587 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	114.0363	112.3063	108.7138	103.8297	100.6589	96.1941	92.3992	97.2615	98.9891	104.0442	109.7522	112.3135 (72)
Total internal gains	325.5065	323.8179	314.0852	298.5244	283.0012	267.8182	257.8112	262.6320	270.4999	286.2317	304.2921	317.5716 (73)

[Jan]				Area m2		Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d	Gains W	
Southeast				6.2400		36.7938	0.4000	0.8000		0.7700	50.9147 (77)	
South				2.2100		46.7521	0.4000	0.8000		0.7700	22.9127 (83)	
Solar gains	73.8274	124.2516	166.4633	201.0539	220.9821	217.6723	210.5612	195.8614	178.4200	136.3256	88.1434	63.3710 (78)
Total gains	399.3338	448.0695	480.5485	499.5783	503.9832	485.4906	468.3724	458.4934	448.9198	422.5573	392.4355	380.9426 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	84.0876	84.3324	84.5787	85.8319	86.0870	87.3857	87.3857	87.6501	86.8616	86.0870	85.5783	85.0756
alpha	6.6058	6.6222	6.6386	6.7221	6.7391	6.8257	6.8257	6.8433	6.7908	6.7391	6.7052	6.6717
util living area	0.9894	0.9764	0.9460	0.8684	0.7244	0.5287	0.3789	0.4032	0.6143	0.8744	0.9736	0.9918 (86)
MIT	20.3998	20.5363	20.7048	20.8751	20.9685	20.9968	20.9997	20.9996	20.9913	20.8883	20.6240	20.3726 (87)
Th 2	20.2310	20.2330	20.2351	20.2455	20.2476	20.2579	20.2579	20.2600	20.2538	20.2476	20.2434	20.2393 (88)
util rest of house	0.9863	0.9700	0.9320	0.8385	0.6755	0.4689	0.3151	0.3386	0.5520	0.8400	0.9654	0.9895 (89)
MIT 2	19.4413	19.6380	19.8753	20.1089	20.2193	20.2559	20.2578	20.2598	20.2477	20.1310	19.7734	19.4087 (90)
Living area fraction	19.9233	20.0897	20.2924	20.4942	20.5961	20.6284	20.6309	20.6318	fLA = Living area / (4) =	20.6216	20.5118	20.2011
MIT	19.9233	20.0897	20.2924	20.4942	20.5961	20.6284	20.6309	20.6318	20.6216	20.5118	20.2011	19.8934 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9233	20.0897	20.2924	20.4942	20.5961	20.6284	20.6309	20.6318	20.6216	20.5118	20.2011	19.8934 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9848	0.9686	0.9332	0.8490	0.6987	0.4989	0.3472	0.3711	0.5831	0.8528	0.9648	0.9881 (94)
Useful gains	393.2775	434.0060	448.4397	424.1191	352.1150	242.2292	162.6177	170.1682	261.7516	360.3772	378.6378	376.4279 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	655.3252	635.2872	575.1689	476.4376	364.4819	243.3215	162.6957	170.2901	264.8164	406.0986	539.9588	650.6214 (97a)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	194.9634	135.2610	94.2865	37.6693	9.2009	0.0000	0.0000	0.0000	0.0000	34.0167	116.1512	203.9999 (98)
Space heating												825.5490 (98)
Space heating per m2										(98) / (4) =		16.2542 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	825.5490 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	866.8265 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1920.6539 (310a)
Electricity used for heat distribution	27.8748 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	238.1302 (332)
Total delivered energy for all uses	3147.6018 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3114.5032	0.2160	672.7327 (367)
Electrical energy for heat distribution	27.8748	0.5190	14.4670 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			687.1997 (373)
Space and water heating			687.1997 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	238.1302	0.5190	123.5896 (379)
Total CO2, kg/year			874.1027 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			17.2100 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			17.2100 ZC1
Total Floor Area		TFA	50.7900
Assumed number of occupants		N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			17.4175 ZC2
CO2 emissions from cooking, equation (L16)			3.1526 ZC3
Total CO2 emissions			37.7801 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			37.7801 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 20.0000 / (5) = 0.1575 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4075 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
Effective ac	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)
External Wall	19.8500	8.4500	11.4000	0.1800	2.0520		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Main Roof	50.7900		50.7900	0.1300	6.6027		(30)
Total net area of external elements Aum(A, m ²)			88.1400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.5572		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.8980 (36)
Total fabric heat loss						(33) + (36) =	30.4552 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	24.3480	24.2160	24.0867	23.4794	23.3658	22.8368	22.8368	22.7389	23.0406	23.3658	23.5957	23.8360 (38)
Heat transfer coeff	54.8031	54.6712	54.5419	53.9346	53.8209	53.2920	53.2920	53.1940	53.4957	53.8209	54.0508	54.2911 (39)
Average = Sum(39)m / 12 =												53.9340 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0790	1.0764	1.0739	1.0619	1.0597	1.0493	1.0493	1.0473	1.0533	1.0597	1.0642	1.0689 (40)
HLP (average)												1.0619 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
Heat gains from water heating, kWh/month	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782 (72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415 (73)

6. Solar gains

[Jan]		Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W					
Southeast		6.2400	36.7938	0.6300	0.7000	0.7700	70.1668 (77)					
South		2.2100	46.7521	0.6300	0.7000	0.7700	31.5766 (78)					
Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains	421.2115	488.9806	537.3716	569.4289	581.3281	561.5651	541.7662	526.3621	510.2428	468.0154	419.7157	398.8747 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	64.3592	64.5145	64.6674	65.3956	65.5337	66.1841	66.1841	66.3060	65.9321	65.5337	65.2550	64.9661
alpha	5.2906	5.3010	5.3112	5.3597	5.3689	5.4123	5.4123	5.4204	5.3955	5.3689	5.3503	5.3311
util living area	0.9910	0.9798	0.9549	0.8941	0.7738	0.5906	0.4302	0.4609	0.6835	0.9078	0.9799	0.9931 (86)
MIT	20.0675	20.2482	20.4792	20.7304	20.9047	20.9823	20.9973	20.9961	20.9617	20.7465	20.3613	20.0316 (87)
Th 2	20.0180	20.0201	20.0222	20.0321	20.0339	20.0425	20.0425	20.0441	20.0392	20.0339	20.0302	20.0263 (88)
util rest of house	0.9883	0.9738	0.9416	0.8642	0.7174	0.5094	0.3380	0.3672	0.6035	0.8752	0.9728	0.9910 (89)
MIT 2	18.7967	19.0581	19.3863	19.7340	19.9472	20.0315	20.0415	20.0426	20.0122	19.7637	19.2307	18.7509 (90)
Living area fraction									fLA = Living area / (4) =			0.5029 (91)
MIT	19.4357	19.6565	19.9359	20.2350	20.4287	20.5096	20.5221	20.5221	20.4897	20.2579	19.7992	19.3949 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4357	19.6565	19.9359	20.2350	20.4287	20.5096	20.5221	20.5221	20.4897	20.2579	19.7992	19.3949 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	415.3806	474.8262	505.2445	496.0228	431.1064	308.7379	208.2760	218.1540	327.7399	413.5646	407.4425	394.5511 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	829.4846	806.7580	732.8192	611.3499	469.7843	314.9351	209.0186	219.2685	341.8192	519.7959	686.4040	824.9505 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	308.0934	223.0582	169.3155	83.0355	28.7764	0.0000	0.0000	0.0000	0.0000	79.0360	200.8523	320.2171 (98)
Space heating												1412.3845 (98)
Space heating per m2										(98) / (4) =		27.8083 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1510.5716 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	308.0934	223.0582	169.3155	83.0355	28.7764	0.0000	0.0000	0.0000	0.0000	79.0360	200.8523	320.2171	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	329.5116	238.5649	181.0861	88.8080	30.7769	0.0000	0.0000	0.0000	0.0000	84.5305	214.8153	342.4782	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	86.4000	85.8891	85.0179	83.4534	81.4534	79.8000	79.8000	79.8000	79.8000	83.2507	85.5226	79.8000	(216)
Fuel for water heating, kWh/month	195.3300	173.4055	184.4968	169.2196	170.4431	156.2471	150.8144	164.4484	163.8315	175.8624	180.1212	190.5268	(219)
Water heating fuel used												2074.7468	(219)
Annual totals kWh/year													
Space heating fuel - main system												1510.5716	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												3903.6947	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1510.5716	0.2160	326.2835 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2074.7468	0.2160	448.1453 (264)
Space and water heating			774.4288 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			939.6661 (272)
Emissions per m2 for space and water heating			15.2477 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.2477 * 1.00) + 2.4870 + 0.7664, rounded to 2 d.p.			18.5000 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	139	Issued on Date	29/04/2022
Assessment Reference	139	Prop Type Ref	
Property			
SAP Rating	83 B	DER	18.26
Environmental	88 B	TER	19.62
CO ₂ Emissions (t/year)	0.79	% DER<TER	6.92
General Requirements Compliance	Fail	DFEE	42.33
		TFEE	48.20
		% DFEE<TFEE	12.16
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 19.62 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 18.26 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)48.2 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)42.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing South East:	6.24 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Windows facing South West:	1.97 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			10.4200	1.1450	11.9313		(27)
External Wall	39.3500	10.4200	28.9300	0.1500	4.3395		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Main Roof	50.7900		50.7900	0.1000	5.0790		(30)
Total net area of external elements Aum(A, m ²)			107.6400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 27.1423		(33)
Party Wall 1			17.5500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.4900 (36)
Total fabric heat loss							(33) + (36) = 35.6323 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	11.7351	11.6015	11.4680	10.8002	10.6666	9.9988	9.9988	9.8652	10.2659	10.6666	10.9337	11.2009 (38)
Heat transfer coeff	47.3674	47.2338	47.1003	46.4325	46.2989	45.6311	45.6311	45.4975	45.8982	46.2989	46.5660	46.8332 (39)
Average = Sum(39)m / 12 =												46.3991 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9326	0.9300	0.9274	0.9142	0.9116	0.8984	0.8984	0.8958	0.9037	0.9116	0.9168	0.9221 (40)
HLP (average)												0.9135 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)

Water storage loss:												110.0000	(47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss													
	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(62)
Solar input												0.0000	(63)
												0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000	(63)
Output from w/h													
	177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(64)
Total per year (kWh/year) = Sum(64)m =												1829.1942	(64)
Heat gains from water heating, kWh/month													
	84.8430	75.4698	80.8830	74.7574	74.8902	69.2597	68.7450	72.3625	71.2721	77.4089	79.0216	83.5613	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.3089	11.8209	9.6134	7.2779	5.4403	4.5930	4.9629	6.4509	8.6584	10.9938	12.8314	13.6788 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	114.0363	112.3063	108.7138	103.8297	100.6589	96.1941	92.3992	97.2615	98.9891	104.0442	109.7522	112.3135 (72)
Total internal gains	325.3314	323.6625	313.9587	298.4287	282.9297	267.7578	257.7459	262.5472	270.3860	286.0871	304.1233	317.3917 (73)

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
Southeast					6.2400	36.7938	0.4000	0.8000	0.7700	50.9147 (77)		
South					2.2100	46.7521	0.4000	0.8000	0.7700	22.9127 (78)		
Southwest					1.9700	36.7938	0.4000	0.8000	0.7700	16.0740 (79)		
Solar gains	89.9014	151.6316	203.9258	247.4718	272.9739	269.2882	260.3244	241.4662	218.9840	166.5863	107.3964	77.1270 (83)
Total gains	415.2328	475.2941	517.8846	545.9005	555.9036	537.0461	518.0703	504.0134	489.3700	452.6734	411.5197	394.5187 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	74.4622	74.6728	74.8845	75.9616	76.1807	77.2956	77.2956	77.5225	76.8457	76.1807	75.7437	75.3117
alpha	5.9641	5.9782	5.9923	6.0641	6.0787	6.1530	6.1530	6.1682	6.1230	6.0787	6.0496	6.0208
util living area	0.9897	0.9765	0.9462	0.8705	0.7304	0.5379	0.3869	0.4142	0.6305	0.8838	0.9755	0.9921 (86)
MIT	20.2682	20.4292	20.6281	20.8326	20.9525	20.9938	20.9993	20.9989	20.9842	20.8426	20.5253	20.2372 (87)
Th 2	20.1399	20.1421	20.1443	20.1554	20.1577	20.1688	20.1688	20.1711	20.1644	20.1577	20.1532	20.1488 (88)
util rest of house	0.9867	0.9700	0.9316	0.8391	0.6774	0.4707	0.3142	0.3401	0.5609	0.8488	0.9674	0.9898 (89)
MIT 2	19.1794	19.4116	19.6922	19.9727	20.1152	20.1650	20.1686	20.1707	20.1534	19.9927	19.5600	19.1416 (90)
Living area fraction	19.7269	19.9233	20.1628	20.4051	20.5362	20.5818	20.5863	20.5872	fLA = Living area / (4) =	20.5712	20.4201	0.5029 (91)
MIT	19.7269	19.9233	20.1628	20.4051	20.5362	20.5818	20.5863	20.5872	20.5712	20.4201	20.0454	19.6925 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7269	19.9233	20.1628	20.4051	20.5362	20.5818	20.5863	20.5872	20.5712	20.4201	20.0454	19.6925 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9849	0.9680	0.9320	0.8490	0.7019	0.5043	0.3507	0.3774	0.5954	0.8606	0.9662	0.9882 (94)
Useful gains	408.9509	460.0696	482.6581	463.4592	390.1961	270.8531	181.7113	190.2121	291.3672	389.5719	397.6067	389.8607 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	730.7337	709.6073	643.5231	534.2110	409.1077	272.9559	181.8998	190.5058	297.0164	454.6578	602.8155	725.5646 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	239.4064	167.6893	119.6836	50.9413	14.0702	0.0000	0.0000	0.0000	0.0000	48.4239	147.7503	249.7637 (98)
Space heating												1037.7288 (98)
Space heating per m2												20.4318 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	1037.7288	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1089.6152	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating:		
Annual water heating requirement	1829.1942	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1920.6539	(310a)
Electricity used for heat distribution	30.1027	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	121.9912	(330a)
Total electricity for the above, kWh/year	121.9912	(331)
Electricity for lighting (calculated in Appendix L)	235.0396	(332)
Total delivered energy for all uses	3367.2999	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			89.5000 (367a)
Space heating from Boilers	3363.4292	0.2160	726.5007 (367)
Electrical energy for heat distribution	30.1027	0.5190	15.6233 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			742.1240 (373)
Space and water heating			742.1240 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	235.0396	0.5190	121.9856 (379)
Total CO2, kg/year			927.4230 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			18.2600 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		18.2600	ZC1
Total Floor Area	TFA	50.7900	
Assumed number of occupants	N	1.7134	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.4175	ZC2
CO2 emissions from cooking, equation (L16)		3.1526	ZC3
Total CO2 emissions		38.8301	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		38.8301	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	+	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1575 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4075 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3464 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4416	0.4330	0.4243	0.3810	0.3724	0.3291	0.3291	0.3204	0.3464	0.3724	0.3897	0.4070 (22b)
Effective ac	0.5975	0.5937	0.5900	0.5726	0.5693	0.5541	0.5541	0.5513	0.5600	0.5693	0.5759	0.5828 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			10.4200	1.3258	13.8144		(27)
External Wall	39.3500	10.4200	28.9300	0.1800	5.2074		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Main Roof	50.7900		50.7900	0.1300	6.6027		(30)
Total net area of external elements Aum(A, m ²)			107.6400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.3243		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.6674 (36)
Total fabric heat loss						(33) + (36) =	36.9917 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	25.0373	24.8786	24.7230	23.9925	23.8558	23.2195	23.2195	23.1017	23.4646	23.8558	24.1323	24.4214 (38)
Heat transfer coeff	62.0290	61.8703	61.7147	60.9842	60.8475	60.2112	60.2112	60.0934	60.4563	60.8475	61.1240	61.4131 (39)
Average = Sum(39)m / 12 =												60.9835 (39)
HLP	1.2213	1.2182	1.2151	1.2007	1.1980	1.1855	1.1855	1.1832	1.1903	1.1980	1.2035	1.2092 (40)
HLP (average)												1.2007 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
Heat gains from water heating, kWh/month	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.3700	11.8751	9.6575	7.3113	5.4653	4.6140	4.9856	6.4805	8.6981	11.0443	12.8903	13.7416 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782 (72)
Total internal gains	319.0571	317.3814	307.6675	292.1267	276.6192	261.4435	251.4333	256.2414	264.0903	279.8021	297.8468	311.1191 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W
Southeast	6.2400	36.7938	0.6300	0.7000	0.7700	70.1668 (77)
South	2.2100	46.7521	0.6300	0.7000	0.7700	31.5766 (78)
Southwest	1.9700	36.7938	0.6300	0.7000	0.7700	22.1520 (79)
Solar gains	123.8953	208.9673	281.0353	341.0471	376.1922	371.1129 358.7596 332.7706 301.7873 229.5768 148.0056 106.2907 (83)
Total gains	442.9525	526.3487	588.7027	633.1738	652.8114	632.5564 610.1929 589.0120 565.8776 509.3789 445.8524 417.4098 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	56.8619	57.0077	57.1514	57.8360	57.9660	58.5785	58.5785	58.6934	58.3410	57.9660	57.7037	57.4321
alpha	4.7908	4.8005	4.8101	4.8557	4.8644	4.9052	4.9052	4.9129	4.8894	4.8644	4.8469	4.8288
util living area	0.9902	0.9774	0.9500	0.8860	0.7653	0.5871	0.4300	0.4632	0.6849	0.9057	0.9786	0.9924 (86)
MIT	19.9097	20.1203	20.3867	20.6758	20.8785	20.9743	20.9954	20.9934	20.9457	20.6857	20.2431	19.8704 (87)
Th 2	19.9030	19.9055	19.9079	19.9194	19.9216	19.9316	19.9316	19.9335	19.9278	19.9216	19.9172	19.9127 (88)
util rest of house	0.9870	0.9705	0.9349	0.8529	0.7042	0.4984	0.3278	0.3590	0.5979	0.8708	0.9709	0.9900 (89)
MIT 2	18.4843	18.7885	19.1663	19.5653	19.8127	19.9161	19.9301	19.9310	19.8902	19.5897	18.9769	18.4344 (90)
Living area fraction	19.2011	19.4582	19.7800	20.1237	20.3487	20.4482	20.4658	20.4652	20.4209	20.1408	19.6137	19.1565 (92)
Temperature adjustment	19.2011	19.4582	19.7800	20.1237	20.3487	20.4482	20.4658	20.4652	20.4209	20.1408	19.6137	19.1565 (93)
adjusted MIT	19.2011	19.4582	19.7800	20.1237	20.3487	20.4482	20.4658	20.4652	20.4209	20.1408	19.6137	19.1565 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	436.0542	508.9850	549.1488	544.4271	476.4035	343.0194	231.4839	242.3891	361.9407	447.6595	431.6554	412.3069 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	924.2989	900.7175	819.5692	684.4711	526.2504	352.1272	232.7623	244.2940	382.1412	580.5342	764.8848	918.5232 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	363.2540	263.2443	201.1928	100.8317	37.0861	0.0000	0.0000	0.0000	0.0000	98.8588	239.9252	376.6249 (98)
Space heating												1681.0177 (98)
Space heating per m2												33.0974 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1797.8799 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	363.2540	263.2443	201.1928	100.8317	37.0861	0.0000	0.0000	0.0000	0.0000	98.8588	239.9252	376.6249	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	388.5070	281.5447	215.1794	107.8414	39.6643	0.0000	0.0000	0.0000	0.0000	105.7313	256.6045	402.8073	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	86.8077	86.3179	85.4789	83.9339	81.8399	79.8000	79.8000	79.8000	79.8000	83.7932	85.9916	86.9497	(216)
Fuel for water heating, kWh/month	194.4125	172.5442	183.5018	168.2509	169.6383	156.2471	150.8144	164.4484	163.8315	174.7238	179.1387	189.6616	(219)
Water heating fuel used												2067.2132	(219)
Annual totals kWh/year													
Space heating fuel - main system												1797.8799	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												236.1179	(232)
Total delivered energy for all uses												4176.2110	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1797.8799	0.2160	388.3421 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2067.2132	0.2160	446.5180 (264)
Space and water heating			834.8601 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	236.1179	0.5190	122.5452 (268)
Total CO2, kg/m2/year			996.3303 (272)
Emissions per m2 for space and water heating			16.4375 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4128 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.4375 * 1.00) + 2.4128 + 0.7664, rounded to 2 d.p.			19.6200 (273)

GLA 'Be Clean' / 'Be Green' Case SAP Worksheets

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010493				Issued on Date	29/04/2022
Assessment Reference	001	Prop Type Ref				
Property						
SAP Rating	83 B	DER	14.90	TER	25.38	
Environmental	87 B	% DER<TER	41.30			
CO ₂ Emissions (t/year)	1.42	DFEE	49.74	TFEE	59.07	
General Requirements Compliance	Pass	% DFEE<TFEE	15.80			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Ground-floor flat, total floor area 121 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 25.38 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.90 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)59.1 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)49.7 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.61	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK

Based on:

Overshading:	Average
Windows facing North East:	5.45 m ² , No overhang
Windows facing South West:	3.69 m ² , No overhang
Windows facing West:	6.48 m ² , No overhang
Windows facing North West:	7.65 m ² , No overhang
Air change rate:	3.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	353.11 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	121.4200 (1b)	x 2.8000 (2b)	= 339.9760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	121.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 339.9760 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							2	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1275 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			23.2700	1.1450	26.6450		(27)					
Ground Floor			121.4200	0.1000	12.1420		(28a)					
External Wall	83.2400	23.2700	59.9700	0.1500	8.9955		(29a)					
Corridor	15.2900	1.8900	13.4000	0.2500	3.3500		(29a)					
Unheated	29.0100		29.0100	0.2000	5.8020		(29a)					
Total net area of external elements Aum(A, m2)			248.9600				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		58.8245		(33)					
Party Wall 1			14.4500	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							17.7556 (36)					
Total fabric heat loss						(33) + (36) =	76.5801 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 31.8976	Feb 31.5400	Mar 31.1824	Apr 29.3943	May 29.0367	Jun 27.2487	Jul 27.2487	Aug 26.8910	Sep 27.9639	Oct 29.0367	Nov 29.7519	Dec 30.4672 (38)
Heat transfer coeff	108.4777	108.1201	107.7625	105.9745	105.6169	103.8288	103.8288	103.4712	104.5440	105.6169	106.3321	107.0473 (39)
Average = Sum(39)m / 12 =												105.8851 (39)
HLP	Jan 0.8934	Feb 0.8905	Mar 0.8875	Apr 0.8728	May 0.8698	Jun 0.8551	Jul 0.8551	Aug 0.8522	Sep 0.8610	Oct 0.8698	Nov 0.8757	Dec 0.8816 (40)
HLP (average)												0.8721 (40)
Days in month												
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8686 (42)
Average daily hot water use (litres/day)												102.3301 (43)
Daily hot water use	Jan 112.5632	Feb 108.4700	Mar 104.3767	Apr 100.2835	May 96.1903	Jun 92.0971	Jul 92.0971	Aug 96.1903	Sep 100.2835	Oct 104.3767	Nov 108.4700	Dec 112.5632 (44)
Energy conte	166.9279	145.9962	150.6550	131.3447	126.0284	108.7529	100.7755	115.6414	117.0225	136.3785	148.8678	161.6608 (45)
Energy content (annual)												Total = Sum(45)m = 1610.0517 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

25.0392	21.8994	22.5983	19.7017	18.9043	16.3129	15.1163	17.3462	17.5534	20.4568	22.3302	24.2491 (46)
Water storage loss:											
Store volume											110.0000 (47)
b) If manufacturer declared loss factor is not known :											
Hot water storage loss factor from Table 2 (kWh/litre/day)											0.0152 (51)
Volume factor from Table 2a											1.0294 (52)
Temperature factor from Table 2b											0.6000 (53)
Enter (49) or (54) in (55)											1.0327 (55)
Total storage loss											
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage											
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month											
222.2047	195.9237	205.9318	184.8384	181.3052	162.2466	156.0523	170.9182	170.5162	191.6553	202.3615	216.9376 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =											0.0000 (63)
Output from w/h											
222.2047	195.9237	205.9318	184.8384	181.3052	162.2466	156.0523	170.9182	170.5162	191.6553	202.3615	216.9376 (64)
Total per year (kWh/year) = Sum(64)m =											2260.8914 (64)
Heat gains from water heating, kWh/month											
99.7250	88.4857	94.3142	86.4671	86.1259	78.9553	77.7293	82.6722	81.7049	89.5673	92.2935	97.9736 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	143.4319	143.4319	143.4319	143.4319	143.4319	143.4319	143.4319	143.4319	143.4319	143.4319	143.4319	143.4319 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.6034	22.7407	18.4940	14.0011	10.4660	8.8359	9.5475	12.4101	16.6569	21.1497	24.6848	26.3150 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.0504	290.0291	282.5229	266.5431	246.3715	227.4130	214.7476	211.7689	219.2751	235.2549	255.4265	274.3850 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3432	37.3432	37.3432	37.3432	37.3432	37.3432	37.3432	37.3432	37.3432	37.3432	37.3432	37.3432 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455 (71)
Water heating gains (Table 5)	134.0389	131.6751	126.7664	120.0931	115.7606	109.6601	104.4749	111.1186	113.4791	120.3861	128.1854	131.6850 (72)
Total internal gains	512.7224	510.4745	493.8129	466.6670	438.6277	411.9386	394.7995	401.3272	415.4406	442.8203	474.3263	498.4146 (73)

6. Solar gains

[Jan]		Area	Solar flux									
		m2	Table 6a	g	Specific data	FF	Access					Gains
			W/m2	or Table 6b	Specific data	or Table 6c	factor					W
							Table 6d					
Northeast		5.4500	11.2829	0.4000	0.8000	0.7700						13.6365 (75)
Southwest		3.6900	36.7938	0.4000	0.8000	0.7700						30.1082 (79)
West		6.4800	19.6403	0.4000	0.8000	0.7700						28.2232 (80)
Northwest		7.6500	11.2829	0.4000	0.8000	0.7700						19.1411 (81)
Solar gains	91.1089	173.2156	281.3024	416.9676	525.2658	545.9518	516.2496	432.4571	328.2033	203.7299	112.4963	75.7435 (83)
Total gains	603.8313	683.6901	775.1153	883.6346	963.8935	957.8904	911.0491	833.7843	743.6440	646.5503	586.8226	574.1581 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	77.7297	77.9868	78.2456	79.5658	79.8352	81.2101	81.2101	81.4908	80.6545	79.8352	79.2982	78.7684
alpha	6.1820	6.1991	6.2164	6.3044	6.3223	6.4140	6.4140	6.4327	6.3770	6.3223	6.2865	6.2512
util living area												
	0.9993	0.9981	0.9935	0.9682	0.8714	0.6719	0.4984	0.5641	0.8509	0.9853	0.9982	0.9995 (86)
MIT												
	20.0197	20.1408	20.3563	20.6523	20.8840	20.9829	20.9978	20.9954	20.9277	20.6239	20.2736	20.0042 (87)
Th 2	20.1731	20.1756	20.1781	20.1907	20.1932	20.2058	20.2058	20.2083	20.2008	20.1932	20.1882	20.1831 (88)
util rest of house												
	0.9990	0.9975	0.9912	0.9566	0.8305	0.5976	0.4101	0.4706	0.7900	0.9780	0.9975	0.9993 (89)
MIT 2												
	18.8437	19.0227	19.3385	19.7716	20.0780	20.1943	20.2049	20.2063	20.1406	19.7385	19.2266	18.8286 (90)
Living area fraction												
	19.0570	19.2255	19.5232	19.9314	20.2242	20.3374	20.3488	20.3495	20.2834	19.8992	19.4166	0.1814 (91)
Temperature adjustment												
	19.0570	19.2255	19.5232	19.9314	20.2242	20.3374	20.3488	20.3495	20.2834	19.8992	19.4166	0.0000 (92)
adjusted MIT												
	19.0570	19.2255	19.5232	19.9314	20.2242	20.3374	20.3488	20.3495	20.2834	19.8992	19.4166	19.0419 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9985	0.9965	0.9887	0.9520	0.8323	0.6104	0.4262	0.4876	0.7971	0.9745	0.9964	0.9989 (94)
Useful gains	602.9233	681.2830	766.3315	841.1959	802.2159	584.6785	388.2763	406.5265	592.7517	630.0654	584.7341	573.5253 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
	1600.8114	1548.8792	1403.4092	1169.0458	900.3041	595.7086	389.2315	408.6587	646.4388	982.1512	1309.6479	1588.7857 (97)
Month fracti												
	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
	742.4287	583.0246	473.9858	236.0520	72.9776	0.0000	0.0000	0.0000	0.0000	261.9518	521.9379	755.3537 (98)
Space heating												
												3647.7123 (98)

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Space heating per m2 (98) / (4) = 30.0421 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	3647.7123 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	4089.0855 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	215.2150 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2260.8914 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2534.4593 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	133.3926 (310b)
Electricity used for heat distribution	69.7215 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	316.2627 (330a)
Total electricity for the above, kWh/year	316.2627 (331)
Electricity for lighting (calculated in Appendix L)	452.1641 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	7740.5791 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	2649.4179	0.5190	1375.0479 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	352.1289	0.5190	182.7549 (368)
Electrical energy for heat distribution	69.7215	0.5190	36.1855 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1593.9883 (373)
Space and water heating			1593.9883 (376)
Pumps and fans	316.2627	0.5190	164.1403 (378)
Energy for lighting	452.1641	0.5190	234.6732 (379)
Energy saving/generation technologies			
PV Unit	-353.1100	0.5190	-183.2641 (380)
Total CO2, kg/year			1809.5377 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.9000 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		14.9000 ZC1
Total Floor Area	TFA	121.4200
Assumed number of occupants	N	2.8686
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		14.0092 ZC2
CO2 emissions from cooking, equation (L16)		1.5471 ZC3
Total CO2 emissions		30.4563 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		30.4563 ZC8

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	121.4200 (1b)	x 2.8000 (2b)	= 339.9760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	121.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 339.9760 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000 / (5) = 0.1177 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3677 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3125 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.3984	0.3906	0.3828	0.3438	0.3359	0.2969	0.2969	0.2891	0.3125	0.3359	0.3516	0.3672 (22b)
Effective ac	0.5794	0.5763	0.5733	0.5591	0.5564	0.5441	0.5441	0.5418	0.5488	0.5564	0.5618	0.5674 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			23.2700	1.3258	30.8504			(27)					
Ground Floor			121.4200	0.1300	15.7846			(28a)					
External Wall	83.2400	23.2700	59.9700	0.1800	10.7946			(29a)					
Corridor	15.2900	1.8900	13.4000	0.1800	2.4120			(29a)					
Unheated	29.0100		29.0100	0.1800	5.2218			(29a)					
Total net area of external elements Aum(A, m2)			248.9600					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		66.9534			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K									250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)									15.0743 (36)				
Total fabric heat loss						(33) + (36) =	82.0277	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	65.0018	64.6560	64.3170	62.7249	62.4270	61.0403	61.0403	60.7835	61.5744	62.4270	63.0296	63.6596	(38)
Heat transfer coeff	147.0295	146.6837	146.3447	144.7526	144.4547	143.0680	143.0680	142.8112	143.6021	144.4547	145.0573	145.6873	(39)
Average = Sum(39)m / 12 =												144.7511	(39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2109	1.2081	1.2053	1.1922	1.1897	1.1783	1.1783	1.1762	1.1827	1.1897	1.1947	1.1999	(40)
HLP (average)												1.1922	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8686 (42)
Average daily hot water use (litres/day)												102.3301 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	112.5632	108.4700	104.3767	100.2835	96.1903	92.0971	92.0971	96.1903	100.2835	104.3767	108.4700	112.5632 (44)
Energy content (annual)	166.9279	145.9962	150.6550	131.3447	126.0284	108.7529	100.7755	115.6414	117.0225	136.3785	148.8678	161.6608 (45)
Distribution loss (46)m = 0.15 x (45)m												
	25.0392	21.8994	22.5983	19.7017	18.9043	16.3129	15.1163	17.3462	17.5534	20.4568	22.3302	24.2491 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

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Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	213.5228	188.0819	197.2499	176.4365	172.6233	153.8447	147.3704	162.2363	162.1144	182.9734	193.9596	208.2557 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	213.5228	188.0819	197.2499	176.4365	172.6233	153.8447	147.3704	162.2363	162.1144	182.9734	193.9596	208.2557 (64)
Heat gains from water heating, kWh/month	92.7795	82.2123	87.3687	79.7456	79.1804	72.2338	70.7838	75.7267	74.9835	82.6218	85.5720	91.0281 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.4319	143.4319	143.4319	143.4319	143.4319	143.4319	143.4319	143.4319	143.4319	143.4319	143.4319	143.4319	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.9003	23.0044	18.7084	14.1635	10.5874	8.9383	9.6581	12.5540	16.8500	21.3949	24.9710	26.6201	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	287.0504	290.0291	282.5229	266.5431	246.3715	227.4130	214.7476	211.7689	219.2751	235.2549	255.4265	274.3850	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3432	37.3432	37.3432	37.3432	37.3432	37.3432	37.3432	37.3432	37.3432	37.3432	37.3432	37.3432	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455	-114.7455	(71)
Water heating gains (Table 5)	124.7036	122.3398	117.4311	110.7578	106.4252	100.3247	95.1395	101.7832	104.1437	111.0508	118.8500	122.3496	(72)
Total internal gains	506.6838	504.4028	487.6920	460.4939	432.4137	405.7057	388.5748	395.1357	409.2984	436.7302	468.2772	492.3843	(73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Northeast			5.4500		11.2829		0.6300		0.7000		0.7700		18.7928 (75)
Southwest			3.6900		36.7938		0.6300		0.7000		0.7700		41.4928 (79)
West			6.4800		19.6403		0.6300		0.7000		0.7700		38.8950 (80)
Northwest			7.6500		11.2829		0.6300		0.7000		0.7700		26.3788 (81)
Solar gains	125.5595	238.7127	387.6698	574.6335	723.8819	752.3898	711.4565	595.9799	452.3052	280.7653	155.0340	104.3840	(83)
Total gains	632.2433	743.1155	875.3618	1035.1274	1156.2956	1158.0954	1100.0313	991.1157	861.6036	717.4955	623.3111	596.7683	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	57.3487	57.4839	57.6170	58.2507	58.3709	58.9366	58.9366	59.0426	58.7174	58.3709	58.1284	57.8770
alpha	4.8232	4.8323	4.8411	4.8834	4.8914	4.9291	4.9291	4.9362	4.9145	4.8914	4.8752	4.8585
util living area	0.9989	0.9974	0.9919	0.9672	0.8860	0.7215	0.5560	0.6307	0.8833	0.9858	0.9977	0.9992 (86)
MIT	19.6048	19.7598	20.0399	20.4240	20.7551	20.9383	20.9863	20.9755	20.8233	20.3895	19.9302	19.5810 (87)
Th 2	19.9113	19.9136	19.9158	19.9263	19.9282	19.9374	19.9374	19.9391	19.9339	19.9282	19.9243	19.9201 (88)
util rest of house	0.9986	0.9965	0.9888	0.9540	0.8415	0.6279	0.4300	0.5008	0.8191	0.9780	0.9968	0.9989 (89)
MIT 2	18.0469	18.2749	18.6845	19.2421	19.6858	19.8963	19.9324	19.9289	19.7852	19.2019	18.5320	18.0182 (90)
Living area fraction	18.3295	18.5443	18.9305	19.4565	19.8798	20.0854	20.1236	20.1188	19.9735	19.4174	18.7857	18.3017 (92)
Temperature adjustment	18.3295	18.5443	18.9305	19.4565	19.8798	20.0854	20.1236	20.1188	19.9735	19.4174	18.7857	18.3017 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	630.7800	739.2104	862.0151	979.6765	970.2729	743.5114	498.2234	519.4621	708.1995	697.9148	620.3009	595.7245 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	2062.7555	2001.4021	1819.1312	1528.0841	1181.6062	784.7793	504.1149	531.0801	843.4492	1273.7114	1695.0945	2054.4435 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	1065.3897	848.1928	712.0943	394.8535	157.2320	0.0000	0.0000	0.0000	0.0000	428.3927	773.8514	1085.2869 (98)
Space heating												5465.2934 (98)
Space heating per m ²												45.0115 (99)

8c. Space cooling requirement

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Not applicable

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													5845.2336 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1065.3897	848.1928	712.0943	394.8535	157.2320	0.0000	0.0000	0.0000	0.0000	428.3927	773.8514	1085.2869	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	1139.4543	907.1581	761.5982	422.3032	168.1626	0.0000	0.0000	0.0000	0.0000	458.1740	827.6486	1160.7347	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	213.5228	188.0819	197.2499	176.4365	172.6233	153.8447	147.3704	162.2363	162.1144	182.9734	193.9596	208.2557	(64)
Efficiency of water heater (217)m	88.5184	88.3499	87.9422	86.9014	84.5659	79.8000	79.8000	79.8000	79.8000	87.0084	88.1317	88.5876	(216)
Fuel for water heating, kWh/month	241.2186	212.8830	224.2950	203.0308	204.1286	192.7879	184.6747	203.3037	203.1509	210.2940	220.0793	235.0844	(219)
Water heating fuel used												2534.9308	(219)
Annual totals kWh/year													
Space heating fuel - main system												5845.2336	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												457.4067	(232)
Total delivered energy for all uses												8912.5712	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	5845.2336	0.2160	1262.5705 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2534.9308	0.2160	547.5451 (264)
Space and water heating			1810.1155 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	457.4067	0.5190	237.3941 (268)
Total CO2, kg/m2/year			2086.4346 (272)
Emissions per m2 for space and water heating			14.9079 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			1.9551 (272b)
Emissions per m2 for pumps and fans			0.3206 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.9079 * 1.55) + 1.9551 + 0.3206, rounded to 2 d.p.			25.3800 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010494			Issued on Date	29/04/2022
Assessment Reference	002	Prop Type Ref			
Property					
SAP Rating	82 B	DER	16.14	TER	28.59
Environmental	89 B	% DER<TER	43.54		
CO ₂ Emissions (t/year)	0.84	DFEE	47.80	TFEE	53.27
General Requirements Compliance	Pass	% DFEE<TFEE	10.25		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aecom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Ground-floor flat, total floor area 66 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 28.59 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.14 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 53.3 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 47.8 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room stats OK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing South West:	5.05 m ² , No overhang
Windows facing West:	2.21 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	353.11 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	65.6200 (1b)	x 2.8000 (2b)	= 183.7360 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.7360 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			1.8900	1.0000	1.8900		(26)	
Window (Uw = 1.20)			7.2600	1.1450	8.3130		(27)	
Ground Floor			65.6200	0.1000	6.5620		(28a)	
External Wall	31.7500	7.2600	24.4900	0.1500	3.6735		(29a)	
Corridor	27.9400	1.8900	26.0500	0.2500	6.5125		(29a)	
Core	19.1000		19.1000	0.2500	4.7750		(29a)	
Total net area of external elements Aum(A, m2)			144.4100				(31)	
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.7260		(33)	
Party Wall 1			15.2000	0.0000	0.0000		(32)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								10.4274 (36)
Total fabric heat loss						(33) + (36) =	42.1534 (37)	

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	16.1113	15.9351	15.7589	14.8778	14.7016	13.8205	13.8205	13.6443	14.1729	14.7016	15.0540	15.4064 (38)
Heat transfer coeff	58.2647	58.0885	57.9122	57.0312	56.8550	55.9739	55.9739	55.7977	56.3263	56.8550	57.2074	57.5598 (39)
Average = Sum(39)m / 12 =												56.9871 (39)
HLP	0.8879	0.8852	0.8825	0.8691	0.8664	0.8530	0.8530	0.8503	0.8584	0.8664	0.8718	0.8772 (40)
HLP (average)												0.8684 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1353 (42)
Average daily hot water use (litres/day)												84.9131 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	93.4044	90.0079	86.6114	83.2149	79.8183	76.4218	76.4218	79.8183	83.2149	86.6114	90.0079	93.4044 (44)
Energy conte	138.5161	121.1471	125.0129	108.9893	104.5778	90.2427	83.6231	95.9588	97.1048	113.1663	123.5299	134.1454 (45)
Energy content (annual)												Total = Sum(45)m = 1336.0141 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

20.7774	18.1721	18.7519	16.3484	15.6867	13.5364	12.5435	14.3938	14.5657	16.9749	18.5295	20.1218 (46)
Water storage loss:											
Store volume											110.0000 (47)
b) If manufacturer declared loss factor is not known :											
Hot water storage loss factor from Table 2 (kWh/litre/day)											0.0152 (51)
Volume factor from Table 2a											1.0294 (52)
Temperature factor from Table 2b											0.6000 (53)
Enter (49) or (54) in (55)											1.0327 (55)
Total storage loss											
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage											
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month											
193.7929	171.0745	180.2897	162.4830	159.8546	143.7364	138.8999	151.2356	150.5985	168.4431	177.0235	189.4222 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =											0.0000 (63)
Output from w/h											
193.7929	171.0745	180.2897	162.4830	159.8546	143.7364	138.8999	151.2356	150.5985	168.4431	177.0235	189.4222 (64)
Total per year (kWh/year) = Sum(64)m =											1986.8539 (64)
Heat gains from water heating, kWh/month											
90.2780	80.2233	85.7882	79.0339	78.9936	72.8006	72.0261	76.1277	75.0823	81.8492	83.8686	88.8248 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	106.7645	106.7645	106.7645	106.7645	106.7645	106.7645	106.7645	106.7645	106.7645	106.7645	106.7645	106.7645 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.2781	16.2344	13.2027	9.9953	7.4716	6.3078	6.8158	8.8595	11.8912	15.0986	17.6223	18.7861 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	186.8669	188.8059	183.9195	173.5168	160.3853	148.0435	139.7985	137.8594	142.7458	153.1485	166.2800	178.6218 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.6764	33.6764	33.6764	33.6764	33.6764	33.6764	33.6764	33.6764	33.6764	33.6764	33.6764	33.6764 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116 (71)
Water heating gains (Table 5)	121.3415	119.3800	115.3068	109.7693	106.1741	101.1120	96.8093	102.3222	104.2810	110.0124	116.4842	119.3882 (72)
Total internal gains	381.5157	379.4497	367.4583	348.3107	329.0604	310.4927	298.4530	304.0704	313.9473	333.2889	355.4159	371.8254 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
Southwest					5.0500	36.7938	0.4000	0.8000	0.7700		41.2050 (79)	
West					2.2100	19.6403	0.4000	0.8000	0.7700		9.6255 (80)	
Solar gains	50.8305	89.0168	127.0428	164.2155	188.7042	189.0528	181.5825	163.3053	140.0491	99.9147	61.3559	43.1784 (83)
Total gains	432.3462	468.4665	494.5011	512.5262	517.7646	499.5455	480.0354	467.3757	453.9965	433.2036	416.7718	415.0038 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	78.2111	78.4484	78.6871	79.9027	80.1503	81.4120	81.4120	81.6691	80.9026	80.1503	79.6566	79.1689
alpha	6.2141	6.2299	6.2458	6.3268	6.3434	6.4275	6.4275	6.4446	6.3935	6.3434	6.3104	6.2779
util living area												
	0.9964	0.9932	0.9846	0.9558	0.8727	0.6910	0.5096	0.5439	0.7893	0.9586	0.9919	0.9972 (86)
MIT												
	20.1850	20.2934	20.4692	20.6980	20.8840	20.9802	20.9975	20.9963	20.9542	20.7344	20.4244	20.1669 (87)
Th 2												
	20.1778	20.1801	20.1824	20.1938	20.1961	20.2076	20.2076	20.2099	20.2030	20.1961	20.1915	20.1870 (88)
util rest of house												
	0.9953	0.9911	0.9796	0.9408	0.8321	0.6162	0.4197	0.4533	0.7216	0.9416	0.9889	0.9963 (89)
MIT 2												
	19.0886	19.2478	19.5037	19.8361	20.0807	20.1942	20.2066	20.2083	20.1672	19.8918	19.4478	19.0692 (90)
Living area fraction												
									fLA = Living area / (4) =			0.3851 (91)
MIT												
	19.5108	19.6504	19.8755	20.1680	20.3900	20.4969	20.5112	20.5118	20.4703	20.2163	19.8239	19.4919 (92)
Temperature adjustment												
												0.0000
adjusted MIT												
	19.5108	19.6504	19.8755	20.1680	20.3900	20.4969	20.5112	20.5118	20.4703	20.2163	19.8239	19.4919 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9940	0.9893	0.9772	0.9402	0.8428	0.6444	0.4545	0.4883	0.7457	0.9421	0.9871	0.9953 (94)
Useful gains	429.7722	463.4661	483.2250	481.8842	436.3580	321.8888	218.1565	228.2298	338.5410	408.1110	411.4018	413.0403 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
	886.2527	856.8298	774.6048	642.6284	494.0712	330.0712	218.9248	229.4269	358.8144	546.7317	727.9015	880.1984 (97)
Month fracti												
	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
	339.6215	264.3404	216.7865	115.7359	42.9386	0.0000	0.0000	0.0000	0.0000	103.1338	227.8798	347.5656 (98)
Space heating												
												1658.0021 (98)
Space heating per m2												
												(98) / (4) = 25.2667 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump	0.9500	(303a)
Fraction of heat from community Boilers	0.0500	(303b)
Fraction of total space heat from community Heat pump	0.9500	(304a)
Fraction of total space heat from community Boilers	0.0500	(304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.1800	(306)
Space heating:		
Annual space heating requirement	1658.0021	(98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1858.6204	(307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	97.8221	(307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1986.8539	(64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2227.2632	(310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	117.2244	(310b)
Electricity used for heat distribution	43.0093	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	176.5244	(330a)
Total electricity for the above, kWh/year	176.5244	(331)
Electricity for lighting (calculated in Appendix L)	322.7961	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
Total delivered energy for all uses	4800.2506	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			250.0000	(367a)
Space heating from Heat pump	1634.3534	0.5190	848.2294	(367)
Efficiency of heat source Boilers			99.0000	(367b)
Space heating from Boilers	217.2187	0.5190	112.7365	(368)
Electrical energy for heat distribution	43.0093	0.5190	22.3218	(372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			983.2878	(373)
Space and water heating			983.2878	(376)
Pumps and fans	176.5244	0.5190	91.6161	(378)
Energy for lighting	322.7961	0.5190	167.5312	(379)
Energy saving/generation technologies				
PV Unit	-353.1100	0.5190	-183.2641	(380)
Total CO2, kg/year			1059.1710	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			16.1400	(384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			16.1400	ZC1
Total Floor Area		TFA	65.6200	
Assumed number of occupants		N	2.1353	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.8749	ZC2
CO2 emissions from cooking, equation (L16)			2.5944	ZC3
Total CO2 emissions			35.6094	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			35.6094	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	65.6200 (1b)	x 2.8000 (2b)	= 183.7360 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.7360 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	+	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) =
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3589 (18)
					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2781 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3546	0.3476	0.3407	0.3059	0.2990	0.2642	0.2642	0.2573	0.2781	0.2990	0.3129	0.3268 (22b)
Effective ac	0.5629	0.5604	0.5580	0.5468	0.5447	0.5349	0.5349	0.5331	0.5387	0.5447	0.5489	0.5534 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			7.2600	1.3258	9.6250		(27)
Ground Floor			65.6200	0.1300	8.5306		(28a)
External Wall	31.7500	7.2600	24.4900	0.1800	4.4082		(29a)
Corridor	27.9400	1.8900	26.0500	0.1800	4.6890		(29a)
Core	19.1000		19.1000	0.1800	3.4380		(29a)
Total net area of external elements Aum(A, m ²)			144.4100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.5808		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.9622 (36)
Total fabric heat loss						(33) + (36) =	41.5430 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	34.1283	33.9802	33.8352	33.1537	33.0262	32.4327	32.4327
Heat transfer coeff	75.6713	75.5232	75.3782	74.6967	74.5692	73.9757	73.9757
Average = Sum(39)m / 12 =						73.8657	74.2043
						74.5692	74.8271
						75.0968	75.6961
						76.6961	77.3961
HLP	1.1532	1.1509	1.1487	1.1383	1.1364	1.1273	1.1273
HLP (average)						1.1257	1.1308
Days in month	31	28	31	30	31	30	31
						30	31
						31	30
						31	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1353 (42)
Average daily hot water use (litres/day)												84.9131 (43)
Daily hot water use	93.4044	90.0079	86.6114	83.2149	79.8183	76.4218	76.4218	79.8183	83.2149	86.6114	90.0079	93.4044 (44)
Energy conte	138.5161	121.1471	125.0129	108.9893	104.5778	90.2427	83.6231	95.9588	97.1048	113.1663	123.5299	134.1454 (45)
Energy content (annual)										Total = Sum(45)m =		1336.0141 (45)
Distribution loss (46)m = 0.15 x (45)m												
20.7774	18.1721	18.7519	16.3484	15.6867	13.5364	12.5435	14.3938	14.5657	16.9749	18.5295	20.1218	(46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (58)
Total heat required for water heating calculated for each month	185.1110	163.2328	171.6078	154.0811	151.1727	135.3345	130.2180	142.5537	142.1967	159.7612	168.6217	180.7403 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
	Solar input (sum of months) = Sum(63)m = 0.0000 (63)											
Output from w/h	185.1110	163.2328	171.6078	154.0811	151.1727	135.3345	130.2180	142.5537	142.1967	159.7612	168.6217	180.7403 (64)
	Total per year (kWh/year) = Sum(64)m = 1884.6315 (64)											
Heat gains from water heating, kWh/month	83.3325	73.9500	78.8427	72.3124	72.0480	66.0792	65.0806	69.1822	68.3608	74.9037	77.1472	81.8793 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	106.7645	106.7645	106.7645	106.7645	106.7645	106.7645	106.7645	106.7645	106.7645	106.7645	106.7645	106.7645 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.8245	16.7198	13.5975	10.2941	7.6950	6.4964	7.0196	9.1244	12.2467	15.5500	18.1492	19.3477 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	186.8669	188.8059	183.9195	173.5168	160.3853	148.0435	139.7985	137.8594	142.7458	153.1485	166.2800	178.6218 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.6764	33.6764	33.6764	33.6764	33.6764	33.6764	33.6764	33.6764	33.6764	33.6764	33.6764	33.6764 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116	-85.4116 (71)
Water heating gains (Table 5)	112.0061	110.0446	105.9714	100.4339	96.8388	91.7766	87.4739	92.9868	94.9456	100.6770	107.1488	110.0528 (72)
Total internal gains	375.7268	373.5997	361.5177	342.2742	322.9484	304.3459	292.3214	297.9999	307.9675	327.4049	349.6074	366.0517 (73)

[Jan				Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Southwest				5.0500	36.7938	0.6300	0.7000		56.7856 (79)			
West				2.2100	19.6403	0.6300	0.7000	0.7700	13.2651 (80)			
Solar gains	70.0507	122.6763	175.0809	226.3094	260.0580	260.5384	250.2433	225.0551	193.0052	137.6950	84.5561	59.5052 (83)
Total gains	445.7775	496.2760	536.5986	568.5837	583.0064	564.8843	542.5647	523.0550	500.9727	465.0999	434.1635	425.5569 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil/m, (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	60.2203	60.3383	60.4544	61.0060	61.1103	61.6006	61.6006	61.6923	61.4108	61.1103	60.8996	60.6810
alpha	5.0147	5.0226	5.0303	5.0671	5.0740	5.1067	5.1067	5.1128	5.0941	5.0740	5.0600	5.0454
util living area	0.9965	0.9934	0.9856	0.9623	0.8986	0.7547	0.5814	0.6226	0.8449	0.9687	0.9930	0.9972 (86)
MIT	19.8278	19.9655	20.1924	20.4884	20.7567	20.9323	20.9856	20.9797	20.8725	20.5337	20.1269	19.8005 (87)
Th 2	19.9576	19.9595	19.9613	19.9697	19.9712	19.9786	19.9786	19.9799	19.9757	19.9712	19.9680	19.9647 (88)
util rest of house	0.9954	0.9912	0.9805	0.9478	0.8580	0.6649	0.4559	0.4978	0.7729	0.9537	0.9902	0.9963 (89)
MIT 2	18.4050	18.6067	18.9369	19.3647	19.7262	19.9317	19.9731	19.9714	19.8731	19.4349	18.8488	18.3702 (90)
Living area fraction									fLA = Living area / (4) =			0.3851 (91)
MIT	18.9529	19.1300	19.4204	19.7975	20.1231	20.3170	20.3630	20.3597	20.2580	19.8580	19.3410	18.9210 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9529	19.1300	19.4204	19.7975	20.1231	20.3170	20.3630	20.3597	20.2580	19.8580	19.3410	18.9210 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9938	0.9888	0.9770	0.9448	0.8648	0.6969	0.5047	0.5462	0.7952	0.9516	0.9878	0.9950 (94)
Useful gains	443.0035	490.7110	524.2441	537.1980	504.2091	393.6868	273.8059	285.6881	398.3753	442.6018	428.8812	423.4317 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
	1108.8039	1074.6947	973.9147	814.0040	628.1005	422.9200	278.3712	292.4844	456.9481	690.3647	915.9580	1105.5007 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
	495.3555	392.4370	334.5549	199.3003	92.1752	0.0000	0.0000	0.0000	0.0000	184.3356	350.6953	507.4593 (98)
Space heating												2556.3132 (99)
Space heating per m2												38.9563 (99)
										(98) / (4) =		

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2734.0248 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	495.3555	392.4370	334.5549	199.3003	92.1752	0.0000	0.0000	0.0000	0.0000	184.3356	350.6953	507.4593	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	529.7920	419.7188	357.8127	213.1554	98.5831	0.0000	0.0000	0.0000	0.0000	197.1504	375.0752	542.7372	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	185.1110	163.2328	171.6078	154.0811	151.1727	135.3345	130.2180	142.5537	142.1967	159.7612	168.6217	180.7403	(64)
Efficiency of water heater (217)m	87.3151	87.0704	86.5648	85.5013	83.5413	79.8000	79.8000	79.8000	79.8000	85.1961	86.7243	87.4215	(216)
Fuel for water heating, kWh/month	212.0034	187.4721	198.2421	180.2091	180.9557	169.5922	163.1805	178.6387	178.1913	187.5216	194.4343	206.7459	(219)
Water heating fuel used												2237.1868	(219)
Annual totals kWh/year													
Space heating fuel - main system												2734.0248	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												332.4474	(232)
Total delivered energy for all uses												5378.6590	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2734.0248	0.2160	590.5494 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2237.1868	0.2160	483.2324 (264)
Space and water heating			1073.7817 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	332.4474	0.5190	172.5402 (268)
Total CO2, kg/m2/year			1285.2469 (272)
Emissions per m2 for space and water heating			16.3636 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.6294 (272b)
Emissions per m2 for pumps and fans			0.5932 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.3636 * 1.55) + 2.6294 + 0.5932, rounded to 2 d.p.			28.5900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010495			Issued on Date	29/04/2022
Assessment Reference	003	Prop Type Ref			
Property					
SAP Rating	84 B	DER	13.20	TER	24.87
Environmental	91 B	% DER<TER	46.92		
CO ₂ Emissions (t/year)	0.74	DFEE	36.82	TFEE	44.38
General Requirements Compliance	Fail	% DFEE<TFEE	17.03		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 70 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 24.87 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.20 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)44.4 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)36.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing North:	1.37 m ² , No overhang
Windows facing North East:	9.00 m ² , No overhang
Windows facing North West:	6.24 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Exposed floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	353.11 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	69.9600 (1b)	x 2.5000 (2b)	= 174.9000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.9000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			16.6100	1.1450	19.0191		(27)
Exposed Floor			18.7900	0.1000	1.8790		(28b)
External Wall	37.2300	16.6100	20.6200	0.1500	3.0930		(29a)
Corridor	5.6000	1.8900	3.7100	0.2500	0.9275		(29a)
Total net area of external elements Aum(A, m2)			61.6200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		26.8086		(33)
Party Wall			39.7800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.2080 (36)
Total fabric heat loss							(33) + (36) = 35.0166 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	16.1644	15.9804	15.7964	14.8766	14.6926	13.7727	13.7727	13.5887	14.1407	14.6926	15.0605	15.4285 (38)
Average = Sum(39)m / 12 =	51.1810	50.9970	50.8130	49.8931	49.7092	48.7893	48.7893	48.6053	49.1572	49.7092	50.0771	50.4451 (39)
	49.8471											(39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7316	0.7289	0.7263	0.7132	0.7105	0.6974	0.6974	0.6948	0.7026	0.7105	0.7158	0.7211 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2452 (42)
Average daily hot water use (litres/day)												87.5224 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.2746	92.7737	89.2728	85.7719	82.2710	78.7702	78.7702	82.2710	85.7719	89.2728	92.7737	96.2746 (44)
Energy conte	142.7725	124.8697	128.8544	112.3384	107.7913	93.0157	86.1928	98.9074	100.0887	116.6437	127.3258	138.2675 (45)
Energy content (annual)												Total = Sum(45)m = 1377.0680 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.4159	18.7305	19.3282	16.8508	16.1687	13.9524	12.9289	14.8361	15.0133	17.4966	19.0989	20.7401 (46)

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	198.0493	174.7972	184.1312	165.8321	163.0681	146.5094	141.4696	154.1842	153.5824	171.9205	180.8194	193.5443	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
	Solar input (sum of months) = Sum (63)m =											0.0000 (63)	
Output from w/h													
	198.0493	174.7972	184.1312	165.8321	163.0681	146.5094	141.4696	154.1842	153.5824	171.9205	180.8194	193.5443	(64)
	Total per year (kWh/year) = Sum (64)m =											2027.9078 (64)	
Heat gains from water heating, kWh/month													
	91.6933	81.4611	87.0655	80.1475	80.0621	73.7227	72.8805	77.1082	76.0744	83.0055	85.1308	90.1954	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.5809	15.6152	12.6991	9.6140	7.1866	6.0672	6.5559	8.5216	11.4376	14.5227	16.9501	18.0695 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.2037	199.2500	194.0933	183.1152	169.2573	156.2328	147.5316	145.4853	150.6420	161.6202	175.4781	188.5025 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061 (71)
Water heating gains (Table 5)	123.2437	121.2219	117.0236	111.3159	107.6103	102.3926	97.9577	103.6400	105.6589	111.5665	118.2372	121.2304 (72)
Total internal gains	394.7055	392.7644	380.4932	360.7224	340.7315	321.3699	308.7225	314.3242	324.4159	344.3867	367.3426	384.4797 (73)

[Jan	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	1.3700	10.6334	0.4000	0.8000	0.7700	3.2305 (74)
Northeast	9.0000	11.2829	0.4000	0.8000	0.7700	22.5189 (75)
Northwest	6.2400	11.2829	0.4000	0.8000	0.7700	15.6131 (81)

Utilisation factor for gains for living area, nil/m, (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	94.9246	95.2671	95.6120	97.3748	97.7352	99.5778	99.5778	99.9547	98.8325	97.7352	97.0170	96.3094
alpha	7.3283	7.3511	7.3741	7.4917	7.5157	7.6385	7.6385	7.6636	7.5888	7.5157	7.4678	7.4206
util living area	0.9965	0.9922	0.9734	0.8796	0.6743	0.4620	0.3357	0.3868	0.6577	0.9364	0.9908	0.9973 (86)
MIT	20.3894	20.4937	20.6798	20.8986	20.9868	20.9993	20.9999	20.9999	20.9920	20.8558	20.5910	20.3734 (87)
Th 2	20.3130	20.3153	20.3176	20.3292	20.3315	20.3431	20.3431	20.3455	20.3385	20.3315	20.3269	20.3223 (88)
util rest of house	0.9954	0.9899	0.9657	0.8527	0.6303	0.4149	0.2857	0.3319	0.5990	0.9147	0.9877	0.9965 (89)
MIT 2	19.4925	19.6458	19.9139	20.2172	20.3199	20.3427	20.3431	20.3454	20.3327	20.1707	19.7969	19.4767 (90)
Living area fraction									fLA = Living area / (4) =			0.3616 (91)
MIT	19.8169	19.9525	20.1909	20.4636	20.5611	20.5802	20.5807	20.5821	20.5712	20.4185	20.0841	19.8010 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8169	19.9525	20.1909	20.4636	20.5611	20.5802	20.5807	20.5821	20.5712	20.4185	20.0841	19.8010 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9944	0.9884	0.9640	0.8585	0.6456	0.4320	0.3038	0.3517	0.6200	0.9178	0.9862	0.9957 (94)
Useful gains	433.6212	471.0212	511.7237	521.2864	433.9619	291.4939	194.1982	203.2275	314.6106	409.8978	413.5421	416.5039 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	794.1673	767.6309	695.6746	576.9440	440.4774	291.7681	194.2133	203.2714	318.1041	488.0672	650.2053	786.9936 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	268.2463	199.3217	136.8595	40.0734	4.8475	0.0000	0.0000	0.0000	0.0000	58.1581	170.3975	275.6443 (98)
Space heating												1153.5484 (98)
Space heating per m2										(98) / (4) =		16.4887 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1153.5484 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1293.1277 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	68.0594 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2027.9078 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2273.2846 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	119.6466 (310b)
Electricity used for heat distribution	37.5412 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	168.0352 (330a)
Total electricity for the above, kWh/year	168.0352 (331)
Electricity for lighting (calculated in Appendix L)	310.4834 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	4232.6368 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1426.5649	0.5190	740.3872 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	189.6019	0.5190	98.4034 (368)
Electrical energy for heat distribution	37.5412	0.5190	19.4839 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			858.2745 (373)
Space and water heating			858.2745 (376)
Pumps and fans	168.0352	0.5190	87.2103 (378)
Energy for lighting	310.4834	0.5190	161.1409 (379)
Energy saving/generation technologies			
PV Unit	-353.1100	0.5190	-183.2641 (380)
Total CO2, kg/year			923.3615 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			13.2000 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			13.2000 ZC1
Total Floor Area		TFA	69.9600
Assumed number of occupants		N	2.2452
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.7037 ZC2
CO2 emissions from cooking, equation (L16)			2.4712 ZC3
Total CO2 emissions			32.3748 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			32.3748 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	69.9600 (1b)	x 2.5000 (2b)	= 174.9000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.9000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					20.0000 / (5) = 0.1144 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3644 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3097 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.3949	0.3871	0.3794	0.3407	0.3329	0.2942	0.2942	0.2865	0.3097	0.3329	0.3484	0.3639 (22b)
	0.5780	0.5749	0.5720	0.5580	0.5554	0.5433	0.5433	0.5410	0.5480	0.5554	0.5607	0.5662 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			15.6100	1.3258	20.6951		(27)
Exposed Floor			18.7900	0.1300	2.4427		(28b)
External Wall	37.2300	15.6100	21.6200	0.1800	3.8916		(29a)
Corridor	5.6000	1.8900	3.7100	0.1800	0.6678		(29a)
Total net area of external elements Aum(A, m ²)			61.6200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.5872		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.2738 (36)
Total fabric heat loss						(33) + (36) =	36.8610 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	33.3581	33.1834	33.0121	32.2077	32.0572	31.3565	31.3565	31.2268	31.6264	32.0572	32.3616	32.6799 (38)
Heat transfer coeff	70.2191	70.0443	69.8731	69.0686	68.9181	68.2175	68.2175	68.0878	68.4874	68.9181	69.2226	69.5409 (39)
Average = Sum(39)m / 12 =												69.0679 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0037	1.0012	0.9988	0.9873	0.9851	0.9751	0.9751	0.9732	0.9790	0.9851	0.9895	0.9940 (40)
HLP (average)												0.9872 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2452 (42)
Average daily hot water use (litres/day)												87.5224 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	96.2746	92.7737	89.2728	85.7719	82.2710	78.7702	78.7702	82.2710	85.7719	89.2728	92.7737	96.2746 (44)
Energy content (annual)	142.7725	124.8697	128.8544	112.3384	107.7913	93.0157	86.1928	98.9074	100.0887	116.6437	127.3258	138.2675 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.4159	18.7305	19.3282	16.8508	16.1687	13.9524	12.9289	14.8361	15.0133	17.4966	19.0989	20.7401 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	189.3674	166.9555	175.4493	157.4302	154.3862	138.1076	132.7877	145.5023	145.1806	163.2386	172.4176	184.8624 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) =	Sum(63)m =			0.0000 (63)
Output from w/h	189.3674	166.9555	175.4493	157.4302	154.3862	138.1076	132.7877	145.5023	145.1806	163.2386	172.4176	184.8624 (64)
								Total per year (kWh/year) =	Sum(64)m =			1925.6854 (64)
Heat gains from water heating, kWh/month	84.7478	75.1878	80.1200	73.4260	73.1165	67.0012	65.9350	70.1626	69.3530	76.0600	78.4093	83.2499 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)m
(66)m	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.5806	15.6149	12.6989	9.6139	7.1865	6.0671	6.5558	8.5214	11.4374	14.5225	16.9499	18.0692	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.2037	199.2500	194.0933	183.1152	169.2573	156.2328	147.5316	145.4853	150.6420	161.6202	175.4781	188.5025	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	(71)
Water heating gains (Table 5)	113.9083	111.8866	107.6882	101.9805	98.2749	93.0572	88.6223	94.3046	96.3236	102.2311	108.9018	111.8950	(72)
Total internal gains	388.3699	386.4288	374.1577	354.3869	334.3960	315.0345	302.3870	307.9886	318.0804	338.0511	361.0070	378.1440	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				1.2900	10.6334	0.6300	0.7000	0.7700	4.1921 (74)			
Northeast				8.4600	11.2829	0.6300	0.7000	0.7700	29.1719 (75)			
Northwest				5.8600	11.2829	0.6300	0.7000	0.7700	20.2065 (81)			
Solar gains	53.5705	108.5225	194.7025	319.2669	429.2206	457.7249	428.1339	341.2003	237.0276	132.3691	67.3023	43.8197 (83)
Total gains	441.9404	494.9514	568.8601	673.6538	763.6166	772.7594	730.5209	649.1889	555.1079	470.4202	428.3094	421.9637 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	69.1882	69.3608	69.5308	70.3406	70.4943	71.2183	71.2183	71.3540	70.9376	70.4943	70.1842	69.8629
alpha	5.6125	5.6241	5.6354	5.6894	5.6996	5.7479	5.7479	5.7569	5.7292	5.6996	5.6789	5.6575
util living area	0.9974	0.9945	0.9827	0.9255	0.7674	0.5555	0.4094	0.4787	0.7752	0.9669	0.9944	0.9980 (86)
MIT	19.9906	20.1232	20.3731	20.7064	20.9240	20.9899	20.9985	20.9966	20.9415	20.6375	20.2584	19.9676 (87)
Th 2	20.0802	20.0823	20.0844	20.0940	20.0958	20.1041	20.1041	20.1057	20.1009	20.0958	20.0921	20.0883 (88)
util rest of house	0.9965	0.9927	0.9768	0.9024	0.7130	0.4819	0.3269	0.3876	0.7008	0.9519	0.9922	0.9973 (89)
MIT 2	18.7316	18.9262	19.2888	19.7591	20.0265	20.0979	20.1036	20.1043	20.0563	19.6769	19.1313	18.7040 (90)
Living area fraction	19.1869	19.3590	19.6809	20.1017	20.3511	20.4205	20.4272	20.4270	20.3764	20.0243	19.5389	19.1610 (91)
MIT	19.1869	19.3590	19.6809	20.1017	20.3511	20.4205	20.4272	20.4270	20.3764	20.0243	19.5389	19.1610 (92)
Temperature adjustment	19.1869	19.3590	19.6809	20.1017	20.3511	20.4205	20.4272	20.4270	20.3764	20.0243	19.5389	19.1610 (93)
adjusted MIT	19.1869	19.3590	19.6809	20.1017	20.3511	20.4205	20.4272	20.4270	20.3764	20.0243	19.5389	19.1610 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9954	0.9908	0.9736	0.9026	0.7292	0.5083	0.3568	0.4206	0.7252	0.9504	0.9904	0.9964	(94)	
Useful gains	439.9002	490.3990	553.8501	608.0477	556.8111	392.8094	260.6312	273.0779	402.5599	447.1062	424.1902	420.4393	(95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)	
Heat loss rate W	1045.3430	1012.7734	920.9892	773.6843	596.2147	397.0586	261.0848	274.1898	429.8561	649.5042	861.0529	1040.4015	(97)	
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)	
Space heating kWh	450.4494	351.0356	273.1515	119.2583	29.3163	0.0000	0.0000	0.0000	0.0000	150.5841	314.5411	461.2519	(98)	
Space heating													2149.5883	(98)
Space heating per m2													30.7260	(99)
	(98) / (4) =													

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2299.0249 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	450.4494	351.0356	273.1515	119.2583	29.3163	0.0000	0.0000	0.0000	0.0000	150.5841	314.5411	461.2519	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	481.7641	375.4391	292.1407	127.5490	31.3543	0.0000	0.0000	0.0000	0.0000	161.0525	336.4076	493.3175	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	189.3674	166.9555	175.4493	157.4302	154.3862	138.1076	132.7877	145.5023	145.1806	163.2386	172.4176	184.8624	(64)
Efficiency of water heater (217)m	87.0456	86.7508	85.9906	84.0850	81.3346	79.8000	79.8000	79.8000	79.8000	84.5995	86.3982	87.1564	(216)
Fuel for water heating, kWh/month	217.5497	192.4540	204.0332	187.2275	189.8161	173.0671	166.4006	182.3338	181.9305	192.9546	199.5616	212.1044	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													2299.0249 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													75.0000 (231)
Electricity for lighting (calculated in Appendix L)													310.4787 (232)
Total delivered energy for all uses													4983.9366 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2299.0249	0.2160	496.5894 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2299.4330	0.2160	496.6775 (264)
Space and water heating			993.2669 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	310.4787	0.5190	161.1384 (268)
Total CO2, kg/m2/year			1193.3304 (272)
Emissions per m2 for space and water heating			14.1976 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3033 (272b)
Emissions per m2 for pumps and fans			0.5564 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.1976 * 1.55) + 2.3033 + 0.5564, rounded to 2 d.p.			24.8700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010496	Issued on Date	29/04/2022
Assessment Reference	004	Prop Type Ref	
Property			
SAP Rating	83 B	DER	15.41
Environmental	89 B	TER	27.86
CO ₂ Emissions (t/year)	0.90	% DER<TER	44.68
General Requirements Compliance	Pass	DFEE	46.45
		TFEE	54.97
		% DFEE<TFEE	15.51
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 75 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 27.86 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.41 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)55.0 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)46.4 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing North East:	9.93 m ² , No overhang
Windows facing East:	2.21 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Exposed floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	353.11 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	74.6300 (1b)	x 2.5000 (2b)	= 186.5750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 186.5750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			12.1400	1.1450	13.9008		(27)
Exposed Floor			74.6300	0.1000	7.4630		(28b)
External Wall	31.9300	12.1400	19.7900	0.1500	2.9685		(29a)
Corridor	25.0000	1.8900	23.1100	0.2500	5.7775		(29a)
Total net area of external elements Aum(A, m2)			131.5600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		31.9998		(33)
Party Wall			41.5000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.0894 (36)
Total fabric heat loss						(33) + (36) =	47.0892 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	16.3602	16.1813	16.0024	15.1077	14.9287	14.0341	14.0341	13.8551	14.3919	14.9287	15.2866	15.6445 (38)
Average = Sum(39)m / 12 =	63.4494	63.2705	63.0915	62.1968	62.0179	61.1232	61.1232	60.9443	61.4811	62.0179	62.3758	62.7337 (39)
												62.1521 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8502	0.8478	0.8454	0.8334	0.8310	0.8190	0.8190	0.8166	0.8238	0.8310	0.8358	0.8406 (40)
Days in month												0.8328 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3531 (42)
Average daily hot water use (litres/day)												90.0860 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	99.0946	95.4911	91.8877	88.2843	84.6808	81.0774	81.0774	84.6808	88.2843	91.8877	95.4911	99.0946 (44)
Energy conte	146.9544	128.5272	132.6286	115.6288	110.9486	95.7402	88.7174	101.8045	103.0204	120.0603	131.0552	142.3175 (45)
Energy content (annual)												Total = Sum(45)m = 1417.4032 (45)
Distribution loss (46)m = 0.15 x (45)m												
	22.0432	19.2791	19.8943	17.3443	16.6423	14.3610	13.3076	15.2707	15.4531	18.0090	19.6583	21.3476 (46)

Water storage loss:													
Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
Solar input	202.2312	178.4547	187.9054	169.1225	166.2254	149.2339	143.9942	157.0813	156.5141	175.3371	184.5489	197.5943	(62)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
	Solar input (sum of months) = Sum(63)m =											0.0000 (63)	
Output from w/h	202.2312	178.4547	187.9054	169.1225	166.2254	149.2339	143.9942	157.0813	156.5141	175.3371	184.5489	197.5943	(64)
	Total per year (kWh/year) = Sum(64)m =											2068.2430 (64)	
Heat gains from water heating, kWh/month													
	93.0838	82.6773	88.3205	81.2415	81.1119	74.6286	73.7200	78.0714	77.0492	84.1415	86.3708	91.5420	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.8330	16.7273	13.6036	10.2988	7.6985	6.4994	7.0228	9.1285	12.2522	15.5570	18.1574	19.3564 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	207.8536	210.0105	204.5753	193.0043	178.3980	164.6701	155.4991	153.3422	158.7774	170.3484	184.9547	198.6826 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238 (71)
Water heating gains (Table 5)	125.1126	123.0316	118.7103	112.8355	109.0213	103.6508	99.0860	104.9347	107.0128	113.0934	119.9594	123.0403 (72)
Total internal gains	410.0957	408.0659	395.1855	374.4349	353.4141	333.1167	319.9042	325.7018	336.3389	357.2953	381.3679	399.3758 (73)

[Jan											Area		Solar flux		g		FF		Access		Gains			
											m2		Table 6a		Table 6b		Table 6c		factor		W			
													W/m2		or Table 6b		or Table 6c		Table 6d					
Northeast											9.9300		11.2829		0.4000		0.8000		0.7700		24.8459		(75)	
East											2.2100		19.6403		0.4000		0.8000		0.7700		9.6255		(76)	
Solar gains	34.4714	69.4041	122.1288	194.8695	256.5765	271.1861	254.6287	206.3297	147.0956	84.1489	43.2644											28.2059	(83)	
Total gains	444.5670	477.4699	517.3143	569.3044	609.9906	604.3027	574.5329	532.0316	483.4345	441.4442	424.6324											427.5817	(84)	

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil/m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	81.6814	81.9125	82.1448	83.3264	83.5668	84.7900	84.7900	85.0390	84.2965	83.5668	83.0874	82.6134
alpha	6.4454	6.4608	6.4763	6.5551	6.5711	6.6527	6.6527	6.6693	6.6198	6.5711	6.5392	6.5076
util living area	0.9978	0.9960	0.9890	0.9555	0.8424	0.6342	0.4665	0.5234	0.8057	0.9723	0.9952	0.9983 (86)
MIT	20.1800	20.2768	20.4628	20.7214	20.9159	20.9894	20.9988	20.9975	20.9536	20.7117	20.4068	20.1638 (87)
Th 2	20.2100	20.2121	20.2142	20.2245	20.2265	20.2369	20.2369	20.2390	20.2327	20.2265	20.2224	20.2183 (88)
util rest of house	0.9972	0.9947	0.9853	0.9406	0.7986	0.5642	0.3865	0.4387	0.7410	0.9601	0.9934	0.9978 (89)
MIT 2	19.1062	19.2488	19.5204	19.8942	20.1450	20.2299	20.2364	20.2379	20.1958	19.8876	19.4468	19.0888 (90)
Living area fraction	19.4962	19.6221	19.8626	20.1946	20.4250	20.5057	20.5132	20.5137	20.4710	20.1869	19.7954	19.3631 (91)
MIT	19.4962	19.6221	19.8626	20.1946	20.4250	20.5057	20.5132	20.5137	20.4710	20.1869	19.7954	19.4792 (92)
Temperature adjustment	19.4962	19.6221	19.8626	20.1946	20.4250	20.5057	20.5132	20.5137	20.4710	20.1869	19.7954	0.0000
adjusted MIT	19.4962	19.6221	19.8626	20.1946	20.4250	20.5057	20.5132	20.5137	20.4710	20.1869	19.7954	19.4792 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9963	0.9935	0.9832	0.9399	0.8106	0.5894	0.4156	0.4696	0.7624	0.9593	0.9920	0.9971 (94)
Useful gains	442.9313	474.3458	508.6342	535.1094	494.4812	356.1631	238.7787	249.8275	368.5872	423.4939	421.2558	426.3399 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	964.1868	931.4744	843.0666	702.4877	541.1039	360.9735	239.1895	250.7075	391.6944	594.5587	791.8864	958.5183 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	387.8141	307.1904	248.8177	120.5124	34.6873	0.0000	0.0000	0.0000	0.0000	127.2722	266.8540	395.9407 (98)
Space heating												1889.0888 (98)
Space heating per m2												25.3127 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1889.0888 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	2117.6685 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	111.4562 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2068.2430 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2318.5004 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	122.0263 (310b)
Electricity used for heat distribution	46.6965 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	179.2519 (330a)
Total electricity for the above, kWh/year	179.2519 (331)
Electricity for lighting (calculated in Appendix L)	332.5970 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	5181.5004 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1774.4675	0.5190	920.9487 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	235.8410	0.5190	122.4015 (368)
Electrical energy for heat distribution	46.6965	0.5190	24.2355 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1067.5856 (373)
Space and water heating			1067.5856 (376)
Pumps and fans	179.2519	0.5190	93.0318 (378)
Energy for lighting	332.5970	0.5190	172.6178 (379)
Energy saving/generation technologies			
PV Unit	-353.1100	0.5190	-183.2641 (380)
Total CO2, kg/year			1149.9711 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.4100 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER	15.4100 ZC1
Total Floor Area	74.6300 TFA
Assumed number of occupants	2.3531 N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190 EF
CO2 emissions from appliances, equation (L14)	16.5040 ZC2
CO2 emissions from cooking, equation (L16)	2.3513 ZC3
Total CO2 emissions	34.2653 ZC4
Residual CO2 emissions offset from biofuel CHP	0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year	0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000 ZC7
Net CO2 emissions	34.2653 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	74.6300 (1b)	x 2.5000 (2b)	= 186.5750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 186.5750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1608 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4108 (18)
Number of sides sheltered					3 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3184 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4059	0.3980	0.3900	0.3502	0.3422	0.3024	0.3024	0.2945	0.3184	0.3422	0.3582	0.3741 (22b)
	0.5824	0.5792	0.5760	0.5613	0.5586	0.5457	0.5457	0.5434	0.5507	0.5586	0.5641	0.5700 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			12.1400	1.3258	16.0947		(27)
Exposed Floor			74.6300	0.1300	9.7019		(28b)
External Wall	31.9300	12.1400	19.7900	0.1800	3.5622		(29a)
Corridor	25.0000	1.8900	23.1100	0.1800	4.1598		(29a)
Total net area of external elements Aum(A, m ²)			131.5600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 35.4086		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.8043 (36)
Total fabric heat loss							(33) + (36) = 49.2129 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	35.8572	35.6602	35.4672	34.5604	34.3907	33.6009	33.6009	33.4546	33.9051	34.3907	34.7339	35.0928 (38)
Heat transfer coeff	85.0701	84.8731	84.6801	83.7733	83.6036	82.8138	82.8138	82.6675	83.1180	83.6036	83.9468	84.3056 (39)
Average = Sum(39)m / 12 =												83.7724 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1399	1.1373	1.1347	1.1225	1.1202	1.1097	1.1097	1.1077	1.1137	1.1202	1.1248	1.1296 (40)
HLP (average)												1.1225 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3531 (42)
Average daily hot water use (litres/day)												90.0860 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	99.0946	95.4911	91.8877	88.2843	84.6808	81.0774	81.0774	84.6808	88.2843	91.8877	95.4911	99.0946 (44)
Energy conte	146.9544	128.5272	132.6286	115.6288	110.9486	95.7402	88.7174	101.8045	103.0204	120.0603	131.0552	142.3175 (45)
Energy content (annual)										Total = Sum(45)m =		1417.4032 (45)
Distribution loss (46)m = 0.15 x (45)m	22.0432	19.2791	19.8943	17.3443	16.6423	14.3610	13.3076	15.2707	15.4531	18.0090	19.6583	21.3476 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	193.5493	170.6130	179.2235	160.7207	157.5435	140.8321	135.3123	148.3994	148.1122	166.6552	176.1471	188.9124 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	193.5493	170.6130	179.2235	160.7207	157.5435	140.8321	135.3123	148.3994	148.1122	166.6552	176.1471	188.9124 (64)
Heat gains from water heating, kWh/month	86.1383	76.4039	81.3749	74.5201	74.1663	67.9071	66.7745	71.1259	70.3277	77.1960	79.6493	84.5965 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.2699	17.1154	13.9192	10.5377	7.8770	6.6501	7.1857	9.3403	12.5365	15.9179	18.5786	19.8055 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	207.8536	210.0105	204.5753	193.0043	178.3980	164.6701	155.4991	153.3422	158.7774	170.3484	184.9547	198.6826 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238 (71)
Water heating gains (Table 5)	115.7772	113.6963	109.3749	103.5001	99.6859	94.3154	89.7506	95.5994	97.6774	103.7580	110.6241	113.7050 (72)
Total internal gains	404.1972	402.1185	389.1657	368.3384	347.2574	326.9321	313.7318	319.5782	330.2877	351.3208	375.4538	393.4894 (73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
Northeast			9.9300		11.2829		0.6300		0.7000		0.7700		34.2408 (75)	
East			2.2100		19.6403		0.6300		0.7000		0.7700		13.2651 (76)	
Solar gains			47.5059	95.6475	168.3087	268.5545	353.5944	373.7283	350.9101	284.3482	202.7161	115.9677	59.6238	38.8713 (83)
Total gains			451.7031	497.7660	557.4744	636.8930	700.8518	700.6604	664.6419	603.9264	533.0038	467.2885	435.0776	432.3607 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	60.9220	61.0634	61.2026	61.8651	61.9906	62.5818	62.5818	62.6926	62.3528	61.9906	61.7372	61.4744
alpha	5.0615	5.0709	5.0802	5.1243	5.1327	5.1721	5.1721	5.1795	5.1569	5.1327	5.1158	5.0983
util living area	0.9979	0.9962	0.9900	0.9635	0.8771	0.7035	0.5369	0.6071	0.8666	0.9805	0.9960	0.9984 (86)
MIT	19.7772	19.9019	20.1470	20.4941	20.7940	20.9530	20.9904	20.9827	20.8586	20.4796	20.0726	19.7562 (87)
Th 2	19.9684	19.9705	19.9726	19.9825	19.9843	19.9930	19.9930	19.9946	19.9896	19.9843	19.9806	19.9767 (88)
util rest of house	0.9972	0.9949	0.9864	0.9495	0.8319	0.6134	0.4199	0.4856	0.8000	0.9705	0.9943	0.9978 (89)
MIT 2	18.3389	18.5224	18.8803	19.3828	19.7814	19.9617	19.9894	19.9873	19.8725	19.3708	18.7795	18.3142 (90)
Living area fraction									fLA = Living area / (4) =			0.3631 (91)
MIT	18.8612	19.0233	19.3403	19.7864	20.1491	20.3217	20.3529	20.3488	20.2306	19.7734	19.2491	18.8378 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8612	19.0233	19.3403	19.7864	20.1491	20.3217	20.3529	20.3488	20.2306	19.7734	19.2491	18.8378 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9961	0.9932	0.9833	0.9461	0.8402	0.6445	0.4627	0.5300	0.8182	0.9677	0.9926	0.9969 (94)
Useful gains	449.9601	494.3727	548.1924	602.5664	588.8599	451.5573	307.5181	320.0987	436.0894	452.2105	431.8665	431.0209 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1238.7209	1198.6906	1087.3151	911.9862	706.3734	473.8339	310.7938	326.4372	509.5610	766.9308	1019.8747	1234.0519 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	586.8380	473.3016	401.1073	222.7822	87.4300	0.0000	0.0000	0.0000	0.0000	234.1519	423.3660	597.4550 (98)
Space heating												3026.4321 (98)
Space heating per m2										(98) / (4) =		40.5525 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3236.8258 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	586.8380	473.3016	401.1073	222.7822	87.4300	0.0000	0.0000	0.0000	0.0000	234.1519	423.3660	597.4550	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	627.6342	506.2049	428.9918	238.2698	93.5081	0.0000	0.0000	0.0000	0.0000	250.4299	452.7978	638.9893	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	193.5493	170.6130	179.2235	160.7207	157.5435	140.8321	135.3123	148.3994	148.1122	166.6552	176.1471	188.9124	(64)
Efficiency of water heater (217)m	87.5873	87.3951	86.9015	85.6851	83.3156	79.8000	79.8000	79.8000	79.8000	85.7208	87.0698	79.8000	(216)
Fuel for water heating, kWh/month	220.9788	195.2204	206.2376	187.5714	189.0924	176.4813	169.5643	185.9642	185.6043	194.4162	202.3057	215.4670	(219)
Water heating fuel used												2328.9035	(219)
Annual totals kWh/year													
Space heating fuel - main system												3236.8258	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												340.3127	(232)
Total delivered energy for all uses												5981.0420	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3236.8258	0.2160	699.1544 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2328.9035	0.2160	503.0431 (264)
Space and water heating			1202.1975 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	340.3127	0.5190	176.6223 (268)
Total CO2, kg/m2/year			1417.7448 (272)
Emissions per m2 for space and water heating			16.1088 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3666 (272b)
Emissions per m2 for pumps and fans			0.5216 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.1088 * 1.55) + 2.3666 + 0.5216, rounded to 2 d.p.			27.8600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010497			Issued on Date	29/04/2022
Assessment Reference	005	Prop Type Ref			
Property					
SAP Rating	82 B	DER	16.07	TER	30.73
Environmental	90 B	% DER<TER	47.71		
CO ₂ Emissions (t/year)	0.65	DFEE	46.28	TFEE	54.78
General Requirements Compliance	Pass	% DFEE<TFEE	15.51		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 30.73 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.07 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 54.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 46.3 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room stats OK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing North East:	6.24 m ² , No overhang
Windows facing East:	2.21 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Exposed floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	353.11 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)
Exposed Floor			50.7900	0.1000	5.0790		(28b)
External Wall	19.8500	8.4500	11.4000	0.1500	1.7100		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Total net area of external elements Aum(A, m ²)				88.1400			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.2571		(33)
Party Wall				37.0000	0.0000	0.0000	(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.9558 (36)
Total fabric heat loss							(33) + (36) = 33.2129 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	11.1341	11.0123	10.8905	10.2816	10.1599	9.5510	9.5510	9.4292	9.7945	10.1599	10.4034	10.6470 (38)
Heat transfer coeff	44.3470	44.2252	44.1034	43.4945	43.3727	42.7639	42.7639	42.6421	43.0074	43.3727	43.6163	43.8598 (39)
Average = Sum(39)m / 12 =												43.4641 (39)
HLP	0.8731	0.8707	0.8683	0.8564	0.8540	0.8420	0.8420	0.8396	0.8468	0.8540	0.8588	0.8636 (40)
HLP (average)												0.8558 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)

Water storage loss:												110.0000	(47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)	
If cylinder contains dedicated solar storage													
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)	
Total heat required for water heating calculated for each month													
177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(62)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)	
Solar input (sum of months) = Sum(63)m =												0.0000	(63)
Output from w/h													
177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(64)	
Total per year (kWh/year) = Sum(64)m =												1829.1942	(64)
Heat gains from water heating, kWh/month													
84.8430	75.4698	80.8830	74.7574	74.8902	69.2597	68.7450	72.3625	71.2721	77.4089	79.0216	83.5613	(65)	

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.4839	11.9763	9.7398	7.3736	5.5119	4.6534	5.0281	6.5357	8.7723	11.1384	13.0002	13.8587 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	114.0363	112.3063	108.7138	103.8297	100.6589	96.1941	92.3992	97.2615	98.9891	104.0442	109.7522	112.3135 (72)
Total internal gains	325.5065	323.8179	314.0852	298.5244	283.0012	267.8182	257.8112	262.6320	270.4999	286.2317	304.2921	317.5716 (73)

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast					6.2400	11.2829	0.4000	0.8000	0.7700	15.6131 (75)
East					2.2100	19.6403	0.4000	0.8000	0.7700	9.6255 (76)

Solar gains	25.2386	50.6105	88.2687	139.2616	181.8285	191.4969	180.0811	146.8995	105.8366	20.6660 (83)
Total gains	350.7451	374.4284	402.3539	437.7860	464.8297	459.3151	437.8922	409.5315	376.3365	338.2376 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nll,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	79.5338	79.7528	79.9730	81.0926	81.3203	82.4781	82.4781	82.7137	82.0111	81.3203	80.8662	80.4171
alpha	6.3023	6.3169	6.3315	6.4062	6.4214	6.4985	6.4985	6.5142	6.4674	6.4214	6.3911	6.3611
util living area	0.9952	0.9917	0.9796	0.9305	0.7969	0.5874	0.4287	0.4769	0.7453	0.9498	0.9896	0.9962 (86)
MIT	20.2376	20.3363	20.5218	20.7677	20.9356	20.9924	20.9991	20.9983	20.9682	20.7633	20.4653	20.2198 (87)
Th 2	20.1904	20.1924	20.1945	20.2048	20.2068	20.2171	20.2171	20.2192	20.2130	20.2068	20.2027	20.1986 (88)
util rest of house	0.9938	0.9892	0.9731	0.9097	0.7485	0.5192	0.3530	0.3971	0.6764	0.9301	0.9859	0.9950 (89)
MIT 2	19.1747	19.3195	19.5881	19.9374	20.1465	20.2122	20.2168	20.2185	20.1890	19.9391	19.5155	19.1552 (90)
Living area fraction									fLA = Living area / (4) =			0.5021 (91)
MIT	19.7083	19.8300	20.0568	20.3542	20.5427	20.6039	20.6096	20.6100	20.5802	20.3529	19.9924	19.6897 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7083	19.8300	20.0568	20.3542	20.5427	20.6039	20.6096	20.6100	20.5802	20.3529	19.9924	19.6897 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9927	0.9878	0.9718	0.9140	0.7698	0.5533	0.3910	0.4372	0.7097	0.9343	0.9847	0.9940 (94)
Useful gains	348.1730	369.8527	391.0157	400.1424	357.8459	254.1311	171.2287	179.0547	267.1016	324.5798	330.7983	336.2151 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	683.3126	660.2814	597.9030	498.1969	383.5314	256.7493	171.4646	179.5238	278.6969	423.0096	562.3173	679.3768 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	249.3439	195.1681	153.9241	70.5992	19.1100	0.0000	0.0000	0.0000	0.0000	73.2318	166.6937	255.3124 (98)
Space heating												1183.3831 (98)
Space heating per m2												23.2995 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1183.3831 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1326.5725 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	69.8196 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2050.5266 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	107.9225 (310b)
Electricity used for heat distribution	35.5484 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	238.1302 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	3914.9627 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1350.8397	0.5190	701.0858 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	179.5374	0.5190	93.1799 (368)
Electrical energy for heat distribution	35.5484	0.5190	18.4496 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			812.7153 (373)
Space and water heating			812.7153 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	238.1302	0.5190	123.5896 (379)
Energy saving/generation technologies			
PV Unit	-353.1100	0.5190	-183.2641 (380)
Total CO2, kg/year			816.3543 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			16.0700 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		16.0700 ZC1
Total Floor Area	TFA	50.7900
Assumed number of occupants	N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.4175 ZC2
CO2 emissions from cooking, equation (L16)		3.1526 ZC3
Total CO2 emissions		36.6401 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		36.6401 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 20.0000 / (5) = 0.1575 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4075 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
Effective ac	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)
Exposed Floor			50.7900	0.1300	6.6027		(28b)
External Wall	19.8500	8.4500	11.4000	0.1800	2.0520		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Total net area of external elements Aum(A, m ²)			88.1400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.5572		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.0756 (36)
Total fabric heat loss						(33) + (36) =	34.6328 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	24.3480	24.2160	24.0867	23.4794	23.3658	22.8368	22.8368	22.7389	23.0406	23.3658	23.5957	23.8360 (38)
Heat transfer coeff	58.9807	58.8488	58.7195	58.1122	57.9985	57.4696	57.4696	57.3716	57.6733	57.9985	58.2284	58.4687 (39)
Average = Sum(39)m / 12 =												58.1116 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1613	1.1587	1.1561	1.1442	1.1419	1.1315	1.1315	1.1296	1.1355	1.1419	1.1465	1.1512 (40)
HLP (average)												1.1442 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												

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Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
Heat gains from water heating, kWh/month	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782 (72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W		
Northeast				6.2400	11.2829	0.6300	0.7000	0.7700		21.5169 (75)		
East				2.2100	19.6403	0.6300	0.7000	0.7700		13.2651 (76)		

Solar gains	34.7820	69.7476	121.6454	191.9199	250.5825	263.9066	248.1742	202.4459	145.8561	84.3160	43.6138	28.4803 (83)
Total gains	354.2501	387.4940	429.6097	484.2714	527.3697	525.4920	499.7608	458.8865	410.2138	364.4577	341.8569	340.0218 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	59.8006	59.9347	60.0667	60.6944	60.8133	61.3730	61.3730	61.4778	61.1562	60.8133	60.5732	60.3243
alpha	4.9867	4.9956	5.0044	5.0463	5.0542	5.0915	5.0915	5.0985	5.0771	5.0542	5.0382	5.0216
util living area	0.9961	0.9932	0.9836	0.9470	0.8441	0.6614	0.4981	0.5600	0.8225	0.9674	0.9924	0.9968 (86)
MIT	19.8335	19.9613	20.2078	20.5473	20.8255	20.9624	20.9927	20.9872	20.8878	20.5359	20.1302	19.8107 (87)
Th 2	19.9511	19.9532	19.9553	19.9649	19.9667	19.9752	19.9752	19.9767	19.9719	19.9667	19.9631	19.9592 (88)
util rest of house	0.9948	0.9909	0.9778	0.9280	0.7927	0.5710	0.3862	0.4431	0.7465	0.9519	0.9895	0.9958 (89)
MIT 2	18.4086	18.5961	18.9543	19.4400	19.8001	19.9511	19.9726	19.9716	19.8838	19.4343	18.8499	18.3811 (90)
Living area fraction									fLA = Living area / (4) =			0.5021 (91)
MIT	19.1240	19.2815	19.5836	19.9960	20.3149	20.4589	20.4847	20.4815	20.3879	19.9874	19.4927	19.0988 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1240	19.2815	19.5836	19.9960	20.3149	20.4589	20.4847	20.4815	20.3879	19.9874	19.4927	19.0988 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9934	0.9890	0.9752	0.9287	0.8115	0.6152	0.4426	0.5021	0.7800	0.9523	0.9877	0.9946 (94)
Ext temp.	351.9111	383.2133	418.9569	449.7246	427.9599	323.2710	221.1971	230.3862	319.9786	347.0818	337.6384	338.1750 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Month fracti	874.3321	846.3345	768.2652	644.8114	499.6535	336.7061	223.2535	234.1615	362.6424	544.4550	721.6076	871.1157 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating	388.6812	311.2174	259.8854	140.4625	53.3401	0.0000	0.0000	0.0000	0.0000	146.8457	276.4578	396.5079 (98)
Space heating per m2												1973.3981 (98)
										(98) / (4) =		38.8541 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2110.5862 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	388.6812	311.2174	259.8854	140.4625	53.3401	0.0000	0.0000	0.0000	0.0000	146.8457	276.4578	396.5079	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	415.7019	332.8529	277.9523	150.2273	57.0482	0.0000	0.0000	0.0000	0.0000	157.0542	295.6768	424.0726	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	86.9696	86.7358	86.1521	84.7995	82.5077	79.8000	79.8000	79.8000	79.8000	84.8218	86.3567	79.8000	(216)
Fuel for water heating, kWh/month	194.0507	171.7129	182.0679	166.5334	168.2653	156.2471	150.8144	164.4484	163.8315	172.6050	178.3814	189.3981	(219)
Water heating fuel used												2058.3561	(219)
Annual totals kWh/year													
Space heating fuel - main system												2110.5862	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												4487.3187	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2110.5862	0.2160	455.8866 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2058.3561	0.2160	444.6049 (264)
Space and water heating			900.4915 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			1065.7289 (272)
Emissions per m2 for space and water heating			17.7297 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.7297 * 1.55) + 2.4870 + 0.7664, rounded to 2 d.p.			30.7300 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010498			Issued on Date	29/04/2022
Assessment Reference	006	Prop Type Ref			
Property					
SAP Rating	83 B	DER	14.41	TER	25.34
Environmental	89 B	% DER<TER	43.13		
CO ₂ Emissions (t/year)	1.00	DFEE	43.42	TFEE	51.71
General Requirements Compliance	Fail	% DFEE<TFEE	16.02		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 88 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 25.34 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.41 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)51.7 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)43.4 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing North East:	12.71 m ² , No overhang
Windows facing East:	1.37 m ² , No overhang
Windows facing South East:	7.38 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Exposed floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	353.11 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	87.5200 (1b)	x 2.5000 (2b)	= 218.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 218.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			21.4600	1.1450	24.5725		(27)
Exposed Floor			87.5200	0.1000	8.7520		(28b)
External Wall	45.5300	21.4600	24.0700	0.1500	3.6105		(29a)
Corridor	10.9800	1.8900	9.0900	0.2500	2.2725		(29a)
Total net area of external elements Aum(A, m ²)			144.0300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.0975		(33)
Party Wall			39.6000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.3464 (36)
Total fabric heat loss						(33) + (36) =	57.4439 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	20.2216	19.9915	19.7613	18.6106	18.3804	17.2297	17.2297	16.9995	17.6900	18.3804	18.8407	19.3010 (38)
Heat transfer coeff	77.6656	77.4354	77.2053	76.0545	75.8243	74.6736	74.6736	74.4434	75.1339	75.8243	76.2847	76.7450 (39)
Average = Sum(39)m / 12 =												75.9970 (39)
HLP	0.8874	0.8848	0.8821	0.8690	0.8664	0.8532	0.8532	0.8506	0.8585	0.8664	0.8716	0.8769 (40)
HLP (average)												0.8683 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5902 (42)
Average daily hot water use (litres/day)												95.7180 (43)
Daily hot water use	105.2898	101.4611	97.6323	93.8036	89.9749	86.1462	86.1462	89.9749	93.8036	97.6323	101.4611	105.2898 (44)
Energy conte	156.1417	136.5625	140.9203	122.8577	117.8849	101.7257	94.2638	108.1691	109.4610	127.5662	139.2485	151.2149 (45)
Energy content (annual)										Total = Sum(45)m =		1506.0165 (45)
Distribution loss (46)m = 0.15 x (45)m	23.4213	20.4844	21.1380	18.4287	17.6827	15.2589	14.1396	16.2254	16.4192	19.1349	20.8873	22.6822 (46)

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	211.4185	186.4900	196.1971	176.3514	173.1617	155.2194	149.5406	163.4459	162.9547	182.8430	192.7422	206.4917	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
	Solar input (sum of months) = Sum (63)m = 0.0000 (63)												
Output from w/h	211.4185	186.4900	196.1971	176.3514	173.1617	155.2194	149.5406	163.4459	162.9547	182.8430	192.7422	206.4917	(64)
	Total per year (kWh/year) = Sum (64)m = 2156.8562 (64)												
Heat gains from water heating, kWh/month													
	96.1386	85.3490	91.0774	83.6451	83.4182	76.6187	75.5642	80.1877	79.1907	86.6372	89.0951	94.5004	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.9005	18.5637	15.0970	11.4294	8.5436	7.2129	7.7938	10.1306	13.5973	17.2649	20.1507	21.4814 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	234.4405	236.8732	230.7428	217.6917	201.2171	185.7333	175.3892	172.9564	179.0869	192.1379	208.6125	224.0963 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092 (71)
Water heating gains (Table 5)	129.2185	127.0074	122.4159	116.1738	112.1212	106.4149	101.5647	107.7791	109.9871	116.4479	123.7432	127.0167 (72)
Total internal gains	446.4130	444.2978	430.1091	407.1484	383.7354	361.2145	346.6011	352.7196	364.5248	387.7042	414.3599	434.4479 (73)

[Jan]			Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				
Northeast			12.7100	11.2829	0.4000	0.8000	0.7700	31.8018 (75)				
East			1.3700	19.6403	0.4000	0.8000	0.7700	5.9669 (76)				
Southeast			7.3800	36.7938	0.4000	0.8000	0.7700	60.2164 (77)				
Solar gains	97.9851	178.9767	276.1939	393.4643	486.5955	503.0205	476.6833	404.3119	316.4320	206.3224	119.5802	82.4105 (83)
Total gains	544.3980	623.2745	706.3030	800.6127	870.3309	864.2350	823.2844	757.0316	680.9567	594.0265	533.9401	516.8584 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil/m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	78.2558	78.4884	78.7223	79.9135	80.1560	81.3913	81.3913	81.6429	80.8926	80.1560	79.6724	79.1945
alpha	6.2171	6.2326	6.2482	6.3276	6.3437	6.4261	6.4261	6.4429	6.3928	6.3437	6.3115	6.2796
util living area	0.9974	0.9933	0.9785	0.9158	0.7588	0.5474	0.3984	0.4508	0.7246	0.9533	0.9934	0.9981 (86)
MIT	20.1502	20.2923	20.5167	20.7884	20.9494	20.9945	20.9994	20.9987	20.9717	20.7485	20.4010	20.1266 (87)
Th 2	20.1782	20.1805	20.1827	20.1939	20.1962	20.2074	20.2074	20.2097	20.2029	20.1962	20.1917	20.1872 (88)
util rest of house	0.9965	0.9912	0.9717	0.8919	0.7082	0.4821	0.3270	0.3742	0.6548	0.9345	0.9910	0.9975 (89)
MIT 2	19.0382	19.2466	19.5712	19.9540	20.1500	20.2040	20.2072	20.2092	20.1820	19.9103	19.4142	19.0106 (90)
Living area fraction									fLA = Living area / (4) =	0.1862	0.1862	0.1862 (91)
MIT	19.2453	19.4414	19.7473	20.1094	20.2988	20.3513	20.3548	20.3562	20.3291	20.0664	19.5980	19.2184 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2453	19.4414	19.7473	20.1094	20.2988	20.3513	20.3548	20.3562	20.3291	20.0664	19.5980	19.2184 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9952	0.9887	0.9671	0.8891	0.7150	0.4941	0.3403	0.3885	0.6664	0.9309	0.9885	0.9964 (94)
Useful gains	541.7763	616.2013	683.0933	711.8186	622.2570	427.0383	280.1986	294.1037	453.8129	552.9647	527.8013	515.0005 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1160.7324	1126.0183	1022.7628	852.5246	652.0022	429.4669	280.3810	294.5148	468.0130	717.7857	953.4063	1152.5882 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	460.5033	342.5970	252.7141	101.3083	22.1305	0.0000	0.0000	0.0000	0.0000	122.6268	306.4356	474.3652 (98)
Space heating												2082.6809 (99)
Space heating per m2												23.7966 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump	0.9500	(303a)
Fraction of heat from community Boilers	0.0500	(303b)
Fraction of total space heat from community Heat pump	0.9500	(304a)
Fraction of total space heat from community Boilers	0.0500	(304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.1800	(306)
Space heating:		
Annual space heating requirement	2082.6809	(98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	2334.6853	(307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	122.8782	(307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	2156.8562	(64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2417.8358	(310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	127.2545	(310b)
Electricity used for heat distribution	50.0265	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	210.2121	(330a)
Total electricity for the above, kWh/year	210.2121	(331)
Electricity for lighting (calculated in Appendix L)	369.1100	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
Total delivered energy for all uses	5581.9760	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			250.0000	(367a)
Space heating from Heat pump	1901.0085	0.5190	986.6234	(367)
Efficiency of heat source Boilers			99.0000	(367b)
Space heating from Boilers	252.6593	0.5190	131.1302	(368)
Electrical energy for heat distribution	50.0265	0.5190	25.9638	(372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1143.7173	(373)
Space and water heating			1143.7173	(376)
Pumps and fans	210.2121	0.5190	109.1001	(378)
Energy for lighting	369.1100	0.5190	191.5681	(379)
Energy saving/generation technologies				
PV Unit	-353.1100	0.5190	-183.2641	(380)
Total CO2, kg/year			1261.1214	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.4100	(384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			14.4100	ZC1
Total Floor Area		TFA	87.5200	
Assumed number of occupants		N	2.5902	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			15.8735	ZC2
CO2 emissions from cooking, equation (L16)			2.0700	ZC3
Total CO2 emissions			32.3534	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			32.3534	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	87.5200 (1b)	x 2.5000 (2b)	= 218.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 218.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 30.0000 / (5) = 0.1371 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3871 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3290 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4195	0.4113	0.4031	0.3619	0.3537	0.3126	0.3126	0.3044	0.3290	0.3537	0.3702	0.3866 (22b)
Effective ac	0.5880	0.5846	0.5812	0.5655	0.5626	0.5489	0.5489	0.5463	0.5541	0.5626	0.5685	0.5747 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			20.0000	1.3258	26.5152		(27)
Exposed Floor			87.5200	0.1300	11.3776		(28b)
External Wall	45.5300	20.0000	25.5300	0.1800	4.5954		(29a)
Corridor	10.9800	1.8900	9.0900	0.1800	1.6362		(29a)
Total net area of external elements Aum(A, m ²)			144.0300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.0144		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.7834 (36)
Total fabric heat loss						(33) + (36) =	60.7978 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	42.4562	42.2095	41.9676	40.8316	40.6191	39.6297	39.6297	39.4465	40.0108	40.6191	41.0491	41.4986 (38)
Heat transfer coeff	103.2540	103.0072	102.7654	101.6294	101.4168	100.4274	100.4274	100.2442	100.8085	101.4168	101.8468	102.2963 (39)
Average = Sum(39)m / 12 =												101.6284 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1798	1.1770	1.1742	1.1612	1.1588	1.1475	1.1475	1.1454	1.1518	1.1588	1.1637	1.1688 (40)
HLP (average)												1.1612 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5902 (42)
Average daily hot water use (litres/day)												95.7180 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	105.2898	101.4611	97.6323	93.8036	89.9749	86.1462	86.1462	89.9749	93.8036	97.6323	101.4611	105.2898 (44)
Energy conte	156.1417	136.5625	140.9203	122.8577	117.8849	101.7257	94.2638	108.1691	109.4610	127.5662	139.2485	151.2149 (45)
Energy content (annual)										Total = Sum(45)m =		1506.0165 (45)
Distribution loss (46)m = 0.15 x (45)m	23.4213	20.4844	21.1380	18.4287	17.6827	15.2589	14.1396	16.2254	16.4192	19.1349	20.8873	22.6822 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	202.7366	178.6482	187.5152	167.9496	164.4798	146.8176	140.8587	154.7640	154.5528	174.1611	184.3404	197.8098 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	202.7366	178.6482	187.5152	167.9496	164.4798	146.8176	140.8587	154.7640	154.5528	174.1611	184.3404	197.8098 (64)
Heat gains from water heating, kWh/month	89.1930	79.0756	84.1319	76.9237	76.4727	69.8973	68.6186	73.2422	72.4693	79.6917	82.3736	87.5549 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115 (66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.9005	18.5637	15.0970	11.4294	8.5436	7.2129	7.7938	10.1306	13.5973	17.2649	20.1507	21.4814 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	234.4405	236.8732	230.7428	217.6917	201.2171	185.7333	175.3892	172.9564	179.0869	192.1379	208.6125	224.0963 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512 (69)	
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)	
Losses e.g. evaporation (negative values) (Table 5)	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092 (71)	
Water heating gains (Table 5)	119.8831	117.6720	113.0805	106.8384	102.7858	97.0795	92.2294	98.4438	100.6517	107.1125	114.4078	117.6813 (72)	
Total internal gains	440.0776	437.9624	423.7737	400.8130	377.4000	354.8792	340.2657	346.3842	358.1894	381.3688	408.0245	428.1125 (73)	

6. Solar gains

[Jan]			Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
Northeast			11.8500	11.2829		0.6300	0.7000		0.7700		40.8613 (75)	
East			1.2800	19.6403		0.6300	0.7000		0.7700		7.6830 (76)	
Southeast			6.8700	36.7938		0.6300	0.7000		0.7700		77.2509 (77)	
Solar gains	125.7952	229.7908	354.6482	505.2835	624.9212	646.0304	612.1995	519.2294	406.3346	264.9111	153.5227	105.7982 (83)
Total gains	565.8728	667.7532	778.4220	906.0965	1002.3212	1000.9095	952.4653	865.6137	764.5240	646.2798	561.5471	533.9107 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.8624	59.0034	59.1423	59.8034	59.9287	60.5191	60.5191	60.6297	60.2903	59.9287	59.6757	59.4135	
alpha	4.9242	4.9336	4.9428	4.9869	4.9952	5.0346	5.0346	5.0420	5.0194	4.9952	4.9784	4.9609	
util living area	0.9972	0.9933	0.9803	0.9316	0.8069	0.6156	0.4587	0.5221	0.7921	0.9646	0.9939	0.9979 (86)	
MIT	19.7619	19.9373	20.2233	20.5871	20.8560	20.9715	20.9946	20.9901	20.9035	20.5379	20.0821	19.7319 (87)	
Th 2	19.9362	19.9385	19.9407	19.9512	19.9531	19.9622	19.9622	19.9639	19.9587	19.9531	19.9492	19.9450 (88)	
util rest of house	0.9963	0.9910	0.9735	0.9085	0.7503	0.5268	0.3533	0.4099	0.7115	0.9479	0.9915	0.9972 (89)	
MIT 2	18.2937	18.5507	18.9651	19.4807	19.8198	19.9446	19.9604	19.9601	19.8854	19.4260	18.7704	18.2562 (90)	
Living area fraction	18.5671	18.8089	19.1994	19.6867	20.0128	20.1358	20.1530	20.1519	20.0750	19.6330	19.0147	18.5310 (92)	
Temperature adjustment	18.5671	18.8089	19.1994	19.6867	20.0128	20.1358	20.1530	20.1519	20.0750	19.6330	19.0147	18.5310 (93)	
adjusted MIT	18.5671	18.8089	19.1994	19.6867	20.0128	20.1358	20.1530	20.1519	20.0750	19.6330	19.0147	18.5310 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9944	0.9875	0.9671	0.9014	0.7539	0.5423	0.3730	0.4308	0.7216	0.9412	0.9883	0.9958 (94)	
Ext temp.	562.7279	659.4144	752.8082	816.7562	755.6422	542.7656	355.2238	372.9091	551.6623	608.2702	554.9716	531.6426 (95)	
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Month fracti	1473.1384	1432.7202	1305.0632	1096.2481	843.0595	555.9482	356.8197	376.1105	602.3352	916.1024	1213.4716	1466.0089 (97)	
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)	
Space heating per m2	677.3454	519.6615	410.8777	201.2342	65.0384	0.0000	0.0000	0.0000	0.0000	229.0271	474.1200	695.1685 (98)	
												3272.4729 (98)	
												37.3911 (99)	

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3499.9710 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	677.3454	519.6615	410.8777	201.2342	65.0384	0.0000	0.0000	0.0000	0.0000	229.0271	474.1200	695.1685	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	724.4336	555.7877	439.4414	215.2237	69.5598	0.0000	0.0000	0.0000	0.0000	244.9488	507.0802	743.4957	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	202.7366	178.6482	187.5152	167.9496	164.4798	146.8176	140.8587	154.7640	154.5528	174.1611	184.3404	197.8098	(64)
Efficiency of water heater (217)m	87.7884	87.4985	86.8507	85.2970	82.5662	79.8000	79.8000	79.8000	79.8000	85.5453	87.2257	87.8895	(216)
Fuel for water heating, kWh/month	230.9378	204.1728	215.9051	196.8997	199.2095	183.9819	176.5147	193.9399	193.6752	203.5895	211.3372	225.0665	(219)
Water heating fuel used												2435.2298	(219)
Annual totals kWh/year													
Space heating fuel - main system												3499.9710	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												369.1100	(232)
Total delivered energy for all uses												6379.3108	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3499.9710	0.2160	755.9937 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2435.2298	0.2160	526.0096 (264)
Space and water heating			1282.0034 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	369.1100	0.5190	191.5681 (268)
Total CO2, kg/m2/year			1512.4965 (272)
Emissions per m2 for space and water heating			14.6481 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.1888 (272b)
Emissions per m2 for pumps and fans			0.4448 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.6481 * 1.55) + 2.1888 + 0.4448, rounded to 2 d.p.			25.3400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010499			Issued on Date	29/04/2022
Assessment Reference	007	Prop Type Ref			
Property					
SAP Rating	83 B	DER	14.33	TER	24.77
Environmental	89 B	% DER<TER	42.14		
CO ₂ Emissions (t/year)	0.99	DFEE	42.64	TFEE	48.65
General Requirements Compliance	Pass	% DFEE<TFEE	12.35		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 87 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 24.77 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.33 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)48.7 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)42.6 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing South East:	1.97 m ² , No overhang
Windows facing South:	3.92 m ² , No overhang
Windows facing South West:	8.41 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Exposed floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	353.11 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	87.0000 (1b)	x 2.5000 (2b)	= 217.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 217.5000 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							2	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1275 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			14.3000	1.1450	16.3740		(27)					
Exposed Floor			87.0000	0.1000	8.7000		(28b)					
External Wall	44.9800	14.3000	30.6800	0.1500	4.6020		(29a)					
Corridor	15.5500	1.8900	13.6600	0.2500	3.4150		(29a)					
Core	18.2300		18.2300	0.2500	4.5575		(29a)					
Total net area of external elements Aum(A, m2)			165.7600				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		39.5385		(33)					
Party Wall			18.8500	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							17.8744 (36)					
Total fabric heat loss						(33) + (36) =	57.4129 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 20.1015	Feb 19.8727	Mar 19.6439	Apr 18.5000	May 18.2712	Jun 17.1273	Jul 17.1273	Aug 16.8985	Sep 17.5849	Oct 18.2712	Nov 18.7288	Dec 19.1864 (38)
Heat transfer coeff	77.5144	77.2856	77.0569	75.9130	75.6842	74.5403	74.5403	74.3115	74.9978	75.6842	76.1417	76.5993 (39)
Average = Sum(39)m / 12 =												75.8558 (39)
HLP	Jan 0.8910	Feb 0.8883	Mar 0.8857	Apr 0.8726	May 0.8699	Jun 0.8568	Jul 0.8568	Aug 0.8542	Sep 0.8620	Oct 0.8699	Nov 0.8752	Dec 0.8805 (40)
HLP (average)												0.8719 (40)
Days in month												
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5824 (42)
Average daily hot water use (litres/day)												95.5318 (43)
Daily hot water use	Jan 105.0850	Feb 101.2637	Mar 97.4424	Apr 93.6211	May 89.7999	Jun 85.9786	Jul 85.9786	Aug 89.7999	Sep 93.6211	Oct 97.4424	Nov 101.2637	Dec 105.0850 (44)
Energy conte	155.8380	136.2969	140.6462	122.6187	117.6556	101.5278	94.0805	107.9587	109.2481	127.3181	138.9777	150.9207 (45)
Energy content (annual)												Total = Sum(45)m = 1503.0869 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	23.3757	20.4445	21.0969	18.3928	17.6483	15.2292	14.1121	16.1938	16.3872	19.0977	20.8466	22.6381 (46)
Water storage loss:												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
211.1148	186.2243	195.9230	176.1124	172.9324	155.0215	149.3573	163.2355	162.7418	182.5949	192.4713	206.1975	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
211.1148	186.2243	195.9230	176.1124	172.9324	155.0215	149.3573	163.2355	162.7418	182.5949	192.4713	206.1975	(64)
Heat gains from water heating, kWh/month												
96.0376	85.2607	90.9863	83.5657	83.3419	76.5529	75.5032	80.1177	79.1199	86.5547	89.0050	94.4026	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
21.1208	18.7593	15.2561	11.5499	8.6337	7.2889	7.8759	10.2374	13.7406	17.4469	20.3631	21.7078	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
233.4490	235.8715	229.7669	216.7711	200.3661	184.9478	174.6474	172.2249	178.3295	191.3253	207.7303	223.1486	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	(71)
Water heating gains (Table 5)												
129.0827	126.8760	122.2934	116.0634	112.0187	106.3235	101.4828	107.6851	109.8888	116.3370	123.6181	126.8852	(72)
Total internal gains												
445.3884	443.2426	429.0523	406.1202	382.7544	360.2961	345.7420	351.8833	363.6948	386.8451	413.4473	433.4775	(73)

6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains
		m2	Table 6a	Specific data	Specific data	factor	W
			W/m2	or Table 6b	or Table 6c	Table 6d	
Southeast		1.9700	36.7938	0.4000	0.8000	0.7700	16.0740 (77)
South		3.9200	46.7521	0.4000	0.8000	0.7700	40.6415 (78)
Southwest		8.4100	36.7938	0.4000	0.8000	0.7700	68.6206 (79)

Solar gains	125.3361	210.8266	282.1774	340.4041	373.8044	368.0651	356.0989	331.4779	302.3021	231.2365	149.6187	107.5989 (83)
Total gains	570.7245	654.0692	711.2297	746.5243	756.5588	728.3612	701.8409	683.3612	665.9969	618.0815	563.0660	541.0764 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	77.9425	78.1732	78.4053	79.5868	79.8273	81.0524	81.0524	81.3019	80.5579	79.8273	79.3476	78.8737
alpha	6.1962	6.2115	6.2270	6.3058	6.3218	6.4035	6.4035	6.4201	6.3705	6.3218	6.2898	6.2582
util living area	0.9965	0.9912	0.9773	0.9351	0.8304	0.6392	0.4654	0.4973	0.7359	0.9439	0.9911	0.9974 (86)
MIT	20.1777	20.3244	20.5212	20.7493	20.9139	20.9869	20.9985	20.9977	20.9688	20.7682	20.4314	20.1518 (87)
Th 2	20.1752	20.1774	20.1797	20.1909	20.1931	20.2044	20.2044	20.2066	20.1999	20.1931	20.1886	20.1841 (88)
util rest of house												
	0.9954	0.9885	0.9702	0.9150	0.7842	0.5665	0.3823	0.4131	0.6659	0.9224	0.9878	0.9966 (89)
MIT 2	19.0759	19.2905	19.5749	19.9011	20.1106	20.1958	20.2038	20.2057	20.1766	19.9333	19.4557	19.0450 (90)
Living area fraction									fLA = Living area / (4) =			0.1782 (91)
MIT	19.2722	19.4747	19.7435	20.0522	20.2537	20.3367	20.3454	20.3468	20.3177	20.0821	19.6295	19.2422 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2722	19.4747	19.7435	20.0522	20.2537	20.3367	20.3454	20.3468	20.3177	20.0821	19.6295	19.2422 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9937	0.9854	0.9655	0.9110	0.7879	0.5789	0.3971	0.4281	0.6768	0.9188	0.9848	0.9953 (94)
Useful gains	567.1336	644.5084	686.6652	680.1143	596.1282	421.6702	278.7216	292.5568	450.7547	567.9191	554.5120	538.5341 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
	1160.5630	1126.4179	1020.5024	846.5973	647.3834	427.6178	279.1813	293.2916	466.3152	717.6428	954.0188	1152.2199 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
	441.5115	323.8432	248.3749	119.8678	38.1339	0.0000	0.0000	0.0000	0.0000	111.3944	287.6449	456.5822 (98)
Space heating												2027.3527 (98)
Space heating per m2												(98) / (4) = 23.3029 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	2027.3527 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	2272.6624 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	119.6138 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2153.9267 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2414.5518 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	127.0817 (310b)
Electricity used for heat distribution	49.3391 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	208.9631 (330a)
Total electricity for the above, kWh/year	208.9631 (331)
Electricity for lighting (calculated in Appendix L)	373.0005 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	5515.8733 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1874.8857	0.5190	973.0657 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	249.1874	0.5190	129.3282 (368)
Electrical energy for heat distribution	49.3391	0.5190	25.6070 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1128.0009 (373)
Space and water heating			1128.0009 (376)
Pumps and fans	208.9631	0.5190	108.4519 (378)
Energy for lighting	373.0005	0.5190	193.5872 (379)
Energy saving/generation technologies			
PV Unit	-353.1100	0.5190	-183.2641 (380)
Total CO2, kg/year			1246.7759 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.3300 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER	14.3300 ZC1
Total Floor Area	TFA 87.0000
Assumed number of occupants	N 2.5824
CO2 emission factor in Table 12 for electricity displaced from grid	EF 0.5190
CO2 emissions from appliances, equation (L14)	15.9008 ZC2
CO2 emissions from cooking, equation (L16)	2.0802 ZC3
Total CO2 emissions	32.3110 ZC4
Residual CO2 emissions offset from biofuel CHP	0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year	0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000 ZC7
Net CO2 emissions	32.3110 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	87.0000 (1b)	x 2.5000 (2b)	= 217.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 217.5000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				3 * 10 =	30.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1379 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3879 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3297 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4204	0.4122	0.4039	0.3627	0.3545	0.3133	0.3133	0.3050	0.3297	0.3545	0.3710	0.3874 (22b)
	0.5884	0.5849	0.5816	0.5658	0.5628	0.5491	0.5491	0.5465	0.5544	0.5628	0.5688	0.5751 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			14.3000	1.3258	18.9583			(27)					
Exposed Floor			87.0000	0.1300	11.3100			(28b)					
External Wall	44.9800	14.3000	30.6800	0.1800	5.5224			(29a)					
Corridor	15.5500	1.8900	13.6600	0.1800	2.4588			(29a)					
Core	18.2300		18.2300	0.1800	3.2814			(29a)					
Total net area of external elements Aum(A, m2)			165.7600					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.4209			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								16.3974 (36)					
Total fabric heat loss						(33) + (36) =		59.8183 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 42.2307	Feb 41.9844	Mar 41.7430	Apr 40.6090	May 40.3968	Jun 39.4091	Jul 39.4091	Aug 39.2262	Sep 39.7895	Oct 40.3968	Nov 40.8260	Dec 41.2747	(38)
Heat transfer coeff	102.0491	101.8027	101.5613	100.4273	100.2151	99.2274	99.2274	99.0445	99.6079	100.2151	100.6443	101.0931	(39)
Average = Sum(39)m / 12 =												100.4263	(39)
HLP	Jan 1.1730	Feb 1.1701	Mar 1.1674	Apr 1.1543	May 1.1519	Jun 1.1405	Jul 1.1405	Aug 1.1384	Sep 1.1449	Oct 1.1519	Nov 1.1568	Dec 1.1620	(40)
HLP (average)												1.1543	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5824 (42)
Average daily hot water use (litres/day)												95.5318 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	105.0850	101.2637	97.4424	93.6211	89.7999	85.9786	85.9786	89.7999	93.6211	97.4424	101.2637	105.0850 (44)
Energy conte	155.8380	136.2969	140.6462	122.6187	117.6556	101.5278	94.0805	107.9587	109.2481	127.3181	138.9777	150.9207 (45)
Energy content (annual)											Total = Sum(45)m =	1503.0869 (45)
Distribution loss	(46)m = 0.15 x (45)m											
	23.3757	20.4445	21.0969	18.3928	17.6483	15.2292	14.1121	16.1938	16.3872	19.0977	20.8466	22.6381 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (58)
Total heat required for water heating calculated for each month	202.4329	178.3826	187.2411	167.7106	164.2505	146.6197	140.6754	154.5536	154.3399	173.9130	184.0695	197.5156 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input	(sum of months) =	Sum(63)m =	0.0000	0.0000 (63)
Output from w/h	202.4329	178.3826	187.2411	167.7106	164.2505	146.6197	140.6754	154.5536	154.3399	173.9130	184.0695	197.5156 (64)
								Total per year (kWh/year) =	Sum(64)m =			2051.7043 (64)
Heat gains from water heating, kWh/month	89.0920	78.9873	84.0408	76.8442	76.3964	69.8315	68.5577	73.1722	72.3985	79.6092	82.2835	87.4571 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.5997	19.1847	15.6020	11.8117	8.8294	7.4542	8.0545	10.4695	14.0522	17.8425	20.8248	22.2000 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	233.4490	235.8715	229.7669	216.7711	200.3661	184.9478	174.6474	172.2249	178.3295	191.3253	207.7303	223.1486 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956 (71)
Water heating gains (Table 5)	119.7474	117.5406	112.9580	106.7281	102.6833	96.9882	92.1474	98.3497	100.5534	107.0016	114.2827	117.5498 (72)
Total internal gains	439.5320	437.3326	423.0628	400.0467	376.6147	354.1260	339.5852	345.7801	357.6709	380.9053	407.5736	427.6343 (73)

[Jan					Area	Solar flux		g	FF	Access		Gains
					m2	Table 6a	Table 6b	Specific data	Specific data	factor		W
						W/m2		or Table 6b	or Table 6c	Table 6d		

Southeast					1.9700	36.7938	0.6300		0.7000	0.7700	22.1520	(77)
South					3.9200	46.7521	0.6300		0.7000	0.7700	56.0091	(78)
Southwest					8.4100	36.7938	0.6300		0.7000	0.7700	94.5677	(79)

Solar gains	172.7288	290.5453	388.8757	469.1194	515.1492	507.2397	490.7488	456.8180	416.6101	318.6728	206.1932	148.2848 (83)
Total gains	612.2608	727.8780	811.9386	869.1661	891.7639	861.3657	830.3340	802.5980	774.2810	699.5780	613.7669	575.9191 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n _{li,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	59.2035	59.3468	59.4879	60.1596	60.2870	60.8871	60.8871	60.9995	60.6545	60.2870	60.0299	59.7634
alpha	4.9469	4.9565	4.9659	5.0106	5.0191	5.0591	5.0591	5.0666	5.0436	5.0191	5.0020	4.9842
util living area	0.9959	0.9900	0.9760	0.9387	0.8517	0.6881	0.5160	0.5533	0.7812	0.9511	0.9908	0.9970 (86)
MIT	19.8235	20.0122	20.2680	20.5693	20.8139	20.9542	20.9912	20.9875	20.9109	20.5933	20.1474	19.7891 (87)
Th 2	19.9417	19.9440	19.9462	19.9567	19.9587	19.9679	19.9679	19.9696	19.9643	19.9587	19.9547	19.9505 (88)
util rest of house	0.9946	0.9867	0.9679	0.9174	0.8013	0.5964	0.4001	0.4366	0.6997	0.9296	0.9872	0.9960 (89)
MIT 2	18.3872	18.6627	19.0325	19.4621	19.7799	19.9379	19.9647	19.9646	19.8973	19.5042	18.8686	18.3434 (90)
Living area fraction									f _{LA} = Living area / (4) =			0.1782 (91)
MIT	18.6431	18.9032	19.2526	19.6594	19.9641	20.1190	20.1476	20.1468	20.0779	19.6982	19.0964	18.6010 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6431	18.9032	19.2526	19.6594	19.9641	20.1190	20.1476	20.1468	20.0779	19.6982	19.0964	18.6010 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9922	0.9822	0.9609	0.9099	0.8016	0.6107	0.4207	0.4573	0.7097	0.9227	0.9830	0.9940
Useful gains	607.4568	714.9120	780.1769	790.8869	714.8180	526.0774	349.3609	367.0616	549.4734	645.5323	603.3571	572.4838
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	1463.7021	1425.5594	1295.1704	1080.5374	828.1912	547.6354	352.0151	371.1045	595.4456	911.7799	1207.3686	1455.8416
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000
Space heating kWh	637.0465	477.5551	383.1552	208.5483	84.3496	0.0000	0.0000	0.0000	0.0000	198.0882	434.8883	657.2183
Space heating												3080.8495
Space heating per m2										(98) / (4) =		35.4121

Regs Region: England
Elmhurst Energy Systems
SAP2012 Calculator (Design
System) version 4.14r19

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												3295.0262 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	637.0465	477.5551	383.1552	208.5483	84.3496	0.0000	0.0000	0.0000	0.0000	198.0882	434.8883	657.2183 (98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000 (210)
Space heating fuel (main heating system)	681.3332	510.7541	409.7916	223.0463	90.2135	0.0000	0.0000	0.0000	0.0000	211.8590	465.1212	702.9072 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	202.4329	178.3826	187.2411	167.7106	164.2505	146.6197	140.6754	154.5536	154.3399	173.9130	184.0695	197.5156 (64)
Efficiency of water heater (217)m	87.6655	87.3161	86.6845	85.3962	83.1350	79.8000	79.8000	79.8000	79.8000	85.1616	87.0297	79.8000 (216)
Fuel for water heating, kWh/month	230.9152	204.2953	216.0028	196.3911	197.5707	183.7339	176.2849	193.6762	193.4084	204.2153	211.5020	225.0118 (219)
Water heating fuel used												2433.0077 (219)
Annual totals kWh/year												
Space heating fuel - main system												3295.0262 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												381.4579 (232)
Total delivered energy for all uses												6184.4918 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3295.0262	0.2160	711.7257 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2433.0077	0.2160	525.5297 (264)
Space and water heating			1237.2553 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	381.4579	0.5190	197.9766 (268)
Total CO2, kg/m2/year			1474.1570 (272)
Emissions per m2 for space and water heating			14.2213 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.2756 (272b)
Emissions per m2 for pumps and fans			0.4474 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.2213 * 1.55) + 2.2756 + 0.4474, rounded to 2 d.p.			24.7700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010500				Issued on Date	29/04/2022
Assessment Reference	008		Prop Type Ref			
Property						
SAP Rating	84 B	DER	12.44	TER	22.33	
Environmental	91 B	% DER<TER	44.30			
CO ₂ Emissions (t/year)	0.74	DFEE	34.51	TFEE	36.09	
General Requirements Compliance	Pass	% DFEE<TFEE	4.38			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 22.33 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.44 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)36.1 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)34.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.23 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing South West:	12.10 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Exposed floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	353.11 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.1200 (1b)	x 2.5000 (2b)	= 182.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 182.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			12.1000	1.1450	13.8550		(27)
Exposed Floor			4.2300	0.1000	0.4230		(28b)
External Wall	25.1000	12.1000	13.0000	0.1500	1.9500		(29a)
Corridor	25.1000	1.8900	23.2100	0.2500	5.8025		(29a)
Core	18.2300		18.2300	0.2500	4.5575		(29a)
Total net area of external elements Aum(A, m ²)			72.6600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.4780		(33)
Party Wall			18.2300	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1496 (36)
Total fabric heat loss							(33) + (36) = 37.6276 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	16.0292	15.8539	15.6786	14.8020	14.6267	13.7501	13.7501	13.5748	14.1007	14.6267	14.9773	15.3280 (38)
Heat transfer coeff	53.6568	53.4815	53.3061	52.4296	52.2542	51.3777	51.3777	51.2023	51.7283	52.2542	52.6049	52.9555 (39)
Average = Sum(39)m / 12 =												52.3857 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.7338	0.7314	0.7290	0.7170	0.7146	0.7026	0.7026	0.7003	0.7074	0.7146	0.7194	0.7242 (40)
HLP (average)												0.7164 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3194 (42)
Average daily hot water use (litres/day)												89.2864 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	98.2150	94.6436	91.0721	87.5007	83.9292	80.3578	80.3578	83.9292	87.5007	91.0721	94.6436	98.2150 (44)
Energy conte	145.6501	127.3865	131.4514	114.6025	109.9639	94.8905	87.9300	100.9009	102.1060	118.9947	129.8920	141.0543 (45)
Energy content (annual)												Total = Sum(45)m = 1404.8227 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	21.8475	19.1080	19.7177	17.1904	16.4946	14.2336	13.1895	15.1351	15.3159	17.8492	19.4838	21.1581 (46)
Water storage loss:												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
200.9269	177.3139	186.7282	168.0962	165.2407	148.3841	143.2068	156.1777	155.5997	174.2715	183.3857	196.3311	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
200.9269	177.3139	186.7282	168.0962	165.2407	148.3841	143.2068	156.1777	155.5997	174.2715	183.3857	196.3311	(64)
Heat gains from water heating, kWh/month												
92.6501	82.2979	87.9290	80.9003	80.7844	74.3460	73.4582	77.7710	76.7452	83.7872	85.9840	91.1220	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
18.4814	16.4151	13.3496	10.1065	7.5547	6.3780	6.8917	8.9581	12.0235	15.2666	17.8184	18.9951	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
204.4667	206.5884	201.2418	189.8593	175.4910	161.9869	152.9652	150.8435	156.1902	167.5726	181.9409	195.4451	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	(71)
Water heating gains (Table 5)												
124.5297	122.4672	118.1842	112.3615	108.5812	103.2584	98.7341	104.5309	106.5905	112.6172	119.4223	122.4758	(72)
Total internal gains												
405.2693	403.2621	390.5670	370.1188	349.4184	329.4147	316.3824	322.1239	332.5957	353.2478	376.9730	394.7074	(73)

6. Solar gains

[Jan]												
	Area	Solar flux	g	Specific data	FF	Access	Gains					
	m2	Table 6a	W/m2	or Table 6b	Specific data	factor	W					
					or Table 6c	Table 6d						
Southwest	12.1000	36.7938	0.4000		0.8000	0.7700	98.7287	(79)				
Solar gains	98.7287	168.1716	230.0997	285.1047	319.3410	317.0317	305.6524	280.1105	249.1493	185.8654	118.2543	84.4912 (83)
Total gains	503.9980	571.4337	620.6667	655.2234	668.7594	646.4463	622.0348	602.2345	581.7449	539.1133	495.2273	479.1986 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	94.6344	94.9446	95.2569	96.8495	97.1745	98.8324	98.8324	99.1708	98.1625	97.1745	96.5267	95.8876
alpha	7.3090	7.3296	7.3505	7.4566	7.4783	7.5888	7.5888	7.6114	7.5442	7.4783	7.4351	7.3925
util living area	0.9934	0.9828	0.9532	0.8670	0.7071	0.5072	0.3633	0.3909	0.6075	0.8855	0.9815	0.9952 (86)
MIT	20.4505	20.5836	20.7478	20.9075	20.9818	20.9987	20.9999	20.9998	20.9951	20.9079	20.6583	20.4253 (87)
Th 2	20.3111	20.3132	20.3153	20.3258	20.3279	20.3385	20.3385	20.3406	20.3343	20.3279	20.3237	20.3195 (88)
util rest of house	0.9915	0.9780	0.9412	0.8387	0.6622	0.4554	0.3088	0.3350	0.5514	0.8545	0.9756	0.9938 (89)
MIT 2	19.5795	19.7726	20.0050	20.2246	20.3116	20.3376	20.3385	20.3405	20.3308	20.2306	19.8899	19.5499 (90)
Living area fraction									fLA = Living area / (4) =			0.3747 (91)
MIT	19.9059	20.0765	20.2834	20.4805	20.5627	20.5853	20.5863	20.5876	20.5797	20.4844	20.1779	19.8779 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9059	20.0765	20.2834	20.4805	20.5627	20.5853	20.5863	20.5876	20.5797	20.4844	20.1779	19.8779 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9901	0.9761	0.9405	0.8456	0.6782	0.4748	0.3292	0.3559	0.5723	0.8623	0.9741	0.9927 (94)
Useful gains	499.0165	557.7845	583.7670	554.0280	453.5690	306.9382	204.7779	214.3617	332.9470	464.8799	482.3805	475.6788 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	837.3631	811.6629	734.7376	607.1629	463.1157	307.5130	204.8078	214.4150	335.1855	516.5015	687.9601	830.2317 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	251.7298	170.6063	112.3221	38.2572	7.1027	0.0000	0.0000	0.0000	0.0000	38.4064	148.0173	263.7873 (98)
Space heating												1030.2292 (98)
Space heating per m2											(98) / (4) =	14.0896 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1030.2292 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1154.8869 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	60.7835 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2055.6625 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2304.3976 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	121.2841 (310b)
Electricity used for heat distribution	36.4135 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	175.6251 (330a)
Total electricity for the above, kWh/year	175.6251 (331)
Electricity for lighting (calculated in Appendix L)	326.3881 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	4143.3653 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1383.7138	0.5190	718.1475 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	183.9067	0.5190	95.4476 (368)
Electrical energy for heat distribution	36.4135	0.5190	18.8986 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			832.4936 (373)
Space and water heating			832.4936 (376)
Pumps and fans	175.6251	0.5190	91.1494 (378)
Energy for lighting	326.3881	0.5190	169.3954 (379)
Energy saving/generation technologies			
PV Unit	-353.1100	0.5190	-183.2641 (380)
Total CO2, kg/year			909.7744 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			12.4400 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		12.4400 ZC1
Total Floor Area	TFA	73.1200
Assumed number of occupants	N	2.3194
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.5704 ZC2
CO2 emissions from cooking, equation (L16)		2.3888 ZC3
Total CO2 emissions		31.3991 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		31.3991 ZC8

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SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.1200 (1b)	x 2.5000 (2b)	= 182.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 182.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 30.0000 / (5) = 0.1641 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4141 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3209 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4092	0.4012	0.3931	0.3530	0.3450	0.3049	0.3049	0.2969	0.3209	0.3450	0.3611	0.3771 (22b)
Effective ac	0.5837	0.5805	0.5773	0.5623	0.5595	0.5465	0.5465	0.5441	0.5515	0.5595	0.5652	0.5711 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			12.1000	1.3258	16.0417			(27)					
Exposed Floor			4.2300	0.1300	0.5499			(28b)					
External Wall	25.1000	12.1000	13.0000	0.1800	2.3400			(29a)					
Corridor	25.1000	1.8900	23.2100	0.1800	4.1778			(29a)					
Core	18.2300		18.2300	0.1800	3.2814			(29a)					
Total net area of external elements Aum(A, m2)			72.6600					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =			28.2808		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K									250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)									7.1699 (36)				
Total fabric heat loss						(33) + (36) =		35.4507 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.2124	35.0163	34.8240	33.9211	33.7522	32.9658	32.9658	32.8202	33.2687	33.7522	34.0939	34.4512	(38)
Heat transfer coeff	70.6630	70.4669	70.2747	69.3718	69.2029	68.4165	68.4165	68.2709	68.7194	69.2029	69.5446	69.9019	(39)
Average = Sum(39)m / 12 =												69.3710	(39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9664	0.9637	0.9611	0.9487	0.9464	0.9357	0.9357	0.9337	0.9398	0.9464	0.9511	0.9560	(40)
HLP (average)												0.9487	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3194 (42)
Average daily hot water use (litres/day)												89.2864 (43)
Daily hot water use	98.2150	94.6436	91.0721	87.5007	83.9292	80.3578	80.3578	83.9292	87.5007	91.0721	94.6436	98.2150 (44)
Energy conte	145.6501	127.3865	131.4514	114.6025	109.9639	94.8905	87.9300	100.9009	102.1060	118.9947	129.8920	141.0543 (45)
Energy content (annual)										Total = Sum(45)m =		1404.8227 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.8475	19.1080	19.7177	17.1904	16.4946	14.2336	13.1895	15.1351	15.3159	17.8492	19.4838	21.1581 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

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Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	192.2450	169.4722	178.0463	159.6944	156.5588	139.9823	134.5249	147.4958	147.1978	165.5896	174.9838	187.6492 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	192.2450	169.4722	178.0463	159.6944	156.5588	139.9823	134.5249	147.4958	147.1978	165.5896	174.9838	187.6492 (64)
Heat gains from water heating, kWh/month	85.7046	76.0246	80.9835	74.1788	73.8389	67.6245	66.5126	70.8255	70.0237	76.8417	79.2626	84.1765 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.8939	16.7814	13.6476	10.3321	7.7234	6.5204	7.0455	9.1580	12.2919	15.6074	18.2161	19.4191	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.4667	206.5884	201.2418	189.8593	175.4910	161.9869	152.9652	150.8435	156.1902	167.5726	181.9409	195.4451	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	(71)
Water heating gains (Table 5)	115.1943	113.1318	108.8488	103.0261	99.2458	93.9230	89.3987	95.1955	97.2552	103.2818	110.0869	113.1404	(72)
Total internal gains	399.3464	397.2931	384.5296	364.0090	343.2516	323.2216	310.2009	315.9885	326.5286	347.2532	371.0353	388.7960	(73)

6. Solar gains

[Jan]			Area	Solar flux	g	FF	Access	Gains					
			m2	Table 6a	Specific data	Specific data	factor	W					
				W/m2	or Table 6b	or Table 6c	Table 6d						
Southwest			12.1000	36.7938	0.6300	0.7000	0.7700	136.0605	(79)				
Solar gains	136.0605	231.7615	317.1061	392.9099	440.0918	436.9093	421.2272	386.0273	343.3589	256.1458	162.9692	116.4395	(83)
Total gains	535.4069	629.0545	701.6357	756.9188	783.3434	760.1309	731.4280	702.0158	669.8875	603.3990	534.0045	505.2355	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	71.8590	72.0590	72.2561	73.1966	73.3752	74.2186	74.2186	74.3769	73.8915	73.3752	73.0147	72.6415
alpha	5.7906	5.8039	5.8171	5.8798	5.8917	5.9479	5.9479	5.9585	5.9261	5.8917	5.8676	5.8428
util living area	0.9944	0.9852	0.9614	0.8949	0.7595	0.5667	0.4103	0.4453	0.6785	0.9187	0.9860	0.9959 (86)
MIT	20.1393	20.3156	20.5419	20.7840	20.9351	20.9905	20.9988	20.9981	20.9737	20.7794	20.4134	20.1063 (87)
Th 2	20.1114	20.1137	20.1159	20.1263	20.1282	20.1373	20.1373	20.1390	20.1338	20.1282	20.1243	20.1202 (88)
util rest of house	0.9926	0.9808	0.9501	0.8665	0.7061	0.4944	0.3306	0.3631	0.6047	0.8900	0.9810	0.9946 (89)
MIT 2	18.9712	19.2275	19.5504	19.8863	20.0693	20.1313	20.1368	20.1382	20.1151	19.8891	19.3788	18.9299 (90)
Living area fraction									fLA = Living area / (4) =			0.3747 (91)
MIT	19.4089	19.6352	19.9220	20.2227	20.3937	20.4533	20.4598	20.4604	20.4369	20.2227	19.7665	19.3707 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4089	19.6352	19.9220	20.2227	20.3937	20.4533	20.4598	20.4604	20.4369	20.2227	19.7665	19.3707 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9908	0.9778	0.9472	0.8700	0.7231	0.5213	0.3605	0.3939	0.6314	0.8935	0.9784	0.9931	(94)
Useful gains	530.4559	615.0675	664.5624	658.5078	566.4511	396.2217	263.6821	276.5460	422.9609	539.1305	522.4829	501.7375	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1067.6429	1038.3453	943.2242	785.4750	601.6325	400.4599	264.0765	277.2080	435.4649	665.9205	880.8887	1060.4627	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	399.6671	284.4427	207.3244	91.4164	26.1750	0.0000	0.0000	0.0000	0.0000	94.3318	258.0522	415.6915	(98)
Space heating												1777.1011	(98)
Space heating per m2												24.3039	(99)

8c. Space cooling requirement

Not applicable

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9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1900.6428 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	399.6671	284.4427	207.3244	91.4164	26.1750	0.0000	0.0000	0.0000	0.0000	94.3318	258.0522	415.6915	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	427.4515	304.2168	221.7373	97.7716	27.9946	0.0000	0.0000	0.0000	0.0000	100.8896	275.9916	444.5899	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	192.2450	169.4722	178.0463	159.6944	156.5588	139.9823	134.5249	147.4958	147.1978	165.5896	174.9838	187.6492	(64)
Efficiency of water heater (217)m	86.7233	86.1854	85.2207	83.3893	81.1747	79.8000	79.8000	79.8000	79.8000	83.3777	85.8486	79.8000	(216)
Fuel for water heating, kWh/month	221.6763	196.6367	208.9239	191.5048	192.8663	175.4164	168.5775	184.8318	184.4584	198.6018	203.8285	215.9941	(219)
Water heating fuel used												2343.3167	(219)
Annual totals kWh/year													
Space heating fuel - main system												1900.6428	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												333.6730	(232)
Total delivered energy for all uses												4652.6326	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1900.6428	0.2160	410.5389 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2343.3167	0.2160	506.1564 (264)
Space and water heating			916.6953 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	333.6730	0.5190	173.1763 (268)
Total CO2, kg/m2/year			1128.7965 (272)
Emissions per m2 for space and water heating			12.5369 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3684 (272b)
Emissions per m2 for pumps and fans			0.5323 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.5369 * 1.55) + 2.3684 + 0.5323, rounded to 2 d.p.			22.3300 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010501			Issued on Date	29/04/2022
Assessment Reference	009	Prop Type Ref			
Property					
SAP Rating	85 B	DER	11.45	TER	22.04
Environmental	92 A	% DER<TER	48.05		
CO ₂ Emissions (t/year)	0.68	DFEE	30.36	TFEE	34.99
General Requirements Compliance	Fail	% DFEE<TFEE	13.24		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 72 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 22.04 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 11.45 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 35.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 30.4 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading: Average
Windows facing South West: 5.88 m², No overhang
Windows facing West: 3.92 m², No overhang
Windows facing North West: 2.55 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 353.11 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.0300 (1b)	x 2.5000 (2b)	= 180.0750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 180.0750 (5)

2. Ventilation rate

					main	secondary		other		total	m3 per hour	
					heating	+	heating	+		=		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Air changes per hour												
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =										0.0000 / (5) =	0.0000 (8)	
Pressure test												
Measured/design AP50												
Infiltration rate												
Number of sides sheltered												
Shelter factor										(20) = 1 - [0.075 x (19)] =	0.8500 (20)	
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =	0.1275 (21)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			12.3500	1.1450	14.1412		(27)					
External Wall	39.7500	12.3500	27.4000	0.1500	4.1100		(29a)					
Corridor	10.1800	1.8900	8.2900	0.2500	2.0725		(29a)					
Total net area of external elements Aum(A, m2)			49.9300				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		22.2137		(33)					
Party Wall			37.2500	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							250.0000 (35)					
Total fabric heat loss							7.1546 (36)					
							(33) + (36) = 29.3683 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 16.6426	Feb 16.4532	Mar 16.2638	Apr 15.3167	May 15.1273	Jun 14.1802	Jul 14.1802	Aug 13.9908	Sep 14.5591	Oct 15.1273	Nov 15.5061	Dec 15.8850 (38)
Heat transfer coeff	46.0110	45.8215	45.6321	44.6851	44.4956	43.5486	43.5486	43.3591	43.9274	44.4956	44.8745	45.2533 (39)
Average = Sum(39)m / 12 =												44.6377 (39)
HLP	Jan 0.6388	Feb 0.6361	Mar 0.6335	Apr 0.6204	May 0.6177	Jun 0.6046	Jul 0.6046	Aug 0.6020	Sep 0.6098	Oct 0.6177	Nov 0.6230	Dec 0.6283 (40)
HLP (average)												0.6197 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2944 (42)
Average daily hot water use (litres/day)												88.6916 (43)
Daily hot water use	Jan 97.5607	Feb 94.0131	Mar 90.4654	Apr 86.9177	May 83.3701	Jun 79.8224	Jul 79.8224	Aug 83.3701	Sep 86.9177	Oct 90.4654	Nov 94.0131	Dec 97.5607 (44)
Energy conte	144.6798	126.5378	130.5757	113.8391	109.2313	94.2583	87.3442	100.2287	101.4258	118.2020	129.0267	140.1146 (45)
Energy content (annual)										Total = Sum(45)m =		1395.4639 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.7020	18.9807	19.5864	17.0759	16.3847	14.1387	13.1016	15.0343	15.2139	17.7303	19.3540	21.0172 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (56)													
If cylinder contains dedicated solar storage													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (57)													
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month													
199.9566 176.4653 185.8525 167.3328 164.5081 147.7520 142.6210 155.5055 154.9194 173.4788 182.5204 195.3914 (62)													
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
199.9566 176.4653 185.8525 167.3328 164.5081 147.7520 142.6210 155.5055 154.9194 173.4788 182.5204 195.3914 (64)													
Total per year (kWh/year) = Sum(64)m =													2046.3037 (64)
Heat gains from water heating, kWh/month													
92.3275 82.0158 87.6379 80.6464 80.5408 74.1358 73.2634 77.5475 76.5190 83.5236 85.6963 90.8096 (65)													

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
(66)m 114.7191 114.7191 114.7191 114.7191 114.7191 114.7191 114.7191 114.7191 114.7191 114.7191 114.7191 114.7191 (66)													
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
18.1753 16.1432 13.1285 9.9391 7.4296 6.2724 6.7775 8.8097 11.8244 15.0137 17.5233 18.6805 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
201.9878 204.0838 198.8019 187.5575 173.3634 160.0230 151.1107 149.0147 154.2966 165.5410 179.7351 193.0756 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.4719 34.4719 34.4719 34.4719 34.4719 34.4719 34.4719 34.4719 34.4719 34.4719 34.4719 34.4719 (69)													
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													
-91.7753 -91.7753 -91.7753 -91.7753 -91.7753 -91.7753 -91.7753 -91.7753 -91.7753 -91.7753 -91.7753 -91.7753 (71)													
Water heating gains (Table 5)													
124.0961 122.0473 117.7928 112.0089 108.2538 102.9664 98.4723 104.2305 106.2764 112.2629 119.0227 122.0559 (72)													
Total internal gains													
401.6749 399.6900 387.1390 366.9213 346.4626 326.6775 313.7763 319.4707 329.8131 350.2334 373.6968 391.2276 (73)													

6. Solar gains

[Jan]													
	Area				Solar flux		g		FF		Access		Gains
	m2				Table 6a		Specific data		Specific data		factor		W
					W/m2		or Table 6b		or Table 6c		Table 6d		
Southwest	5.8800				36.7938		0.4000		0.8000		0.7700		47.9773 (79)
West	3.9200				19.6403		0.4000		0.8000		0.7700		17.0733 (80)
Northwest	2.5500				11.2829		0.4000		0.8000		0.7700		6.3804 (81)
Solar gains	71.4309	128.1094	190.2195	257.1940	305.1504	309.7707	295.8612	259.4911	213.5576	145.8237	86.7822	60.3093 (83)	
Total gains	473.1058	527.7994	577.3585	624.1152	651.6129	636.4482	609.6375	578.9618	543.3707	496.0571	460.4790	451.5369 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	108.7150	109.1644	109.6176	111.9409	112.4174	114.8622	114.8622	115.3640	113.8716	112.4174	111.4684	110.5352
alpha	8.2477	8.2776	8.3078	8.4627	8.4945	8.6575	8.6575	8.6909	8.5914	8.4945	8.4312	8.3690
util living area	0.9929	0.9814	0.9429	0.8200	0.6301	0.4377	0.3143	0.3445	0.5562	0.8610	0.9785	0.9948 (86)
MIT	20.5706	20.6839	20.8312	20.9583	20.9953	20.9998	21.0000	21.0000	20.9987	20.9485	20.7502	20.5518 (87)
Th 2	20.3952	20.3976	20.3999	20.4117	20.4141	20.4259	20.4259	20.4282	20.4211	20.4141	20.4093	20.4046 (88)
util rest of house	0.9909	0.9765	0.9295	0.7906	0.5921	0.3985	0.2733	0.3017	0.5102	0.8295	0.9720	0.9933 (89)
MIT 2	19.8230	19.9873	20.1942	20.3674	20.4100	20.4258	20.4259	20.4282	20.4202	20.3607	20.0932	19.8036 (90)
Living area fraction									fLA = Living area / (4) =			0.3762 (91)
MIT	20.1043	20.2494	20.4338	20.5897	20.6302	20.6417	20.6419	20.6433	20.6379	20.5819	20.3404	20.0851 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1043	20.2494	20.4338	20.5897	20.6302	20.6417	20.6419	20.6433	20.6379	20.5819	20.3404	20.0851 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9897	0.9751	0.9304	0.7998	0.6062	0.4133	0.2887	0.3178	0.5275	0.8390	0.9712	0.9923 (94)	
Useful gains	468.2435	514.6505	537.1574	499.1664	395.0128	263.0353	176.0150	183.9817	286.6253	416.1828	447.1976	448.0649 (95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W													
727.1693 703.3320 635.8312 522.3548 397.3557 263.1090 176.0177 183.9876 287.1920 444.1506 594.1564 718.8542 (97)													
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)	
Space heating kWh													
192.6408 126.7939 73.4133 16.6957 1.7431 0.0000 0.0000 0.0000 0.0000 20.8080 105.8104 201.4672 (98)													
Space heating													739.3725 (98)
Space heating per m2													10.2648 (99)
(98) / (4) =													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	739.3725 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	828.8365 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	43.6230 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2046.3037 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2293.9064 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	120.7319 (310b)
Electricity used for heat distribution	32.8710 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	173.0071 (330a)
Total electricity for the above, kWh/year	173.0071 (331)
Electricity for lighting (calculated in Appendix L)	320.9819 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	3781.0868 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1249.0972	0.5190	648.2814 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	166.0150	0.5190	86.1618 (368)
Electrical energy for heat distribution	32.8710	0.5190	17.0600 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			751.5033 (373)
Space and water heating			751.5033 (376)
Pumps and fans	173.0071	0.5190	89.7907 (378)
Energy for lighting	320.9819	0.5190	166.5896 (379)
Energy saving/generation technologies			
PV Unit	-353.1100	0.5190	-183.2641 (380)
Total CO2, kg/year			824.6195 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			11.4500 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		11.4500 ZC1
Total Floor Area	TFA	72.0300
Assumed number of occupants	N	2.2944
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.6172 ZC2
CO2 emissions from cooking, equation (L16)		2.4166 ZC3
Total CO2 emissions		30.4838 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		30.4838 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.0300 (1b)	x 2.5000 (2b)	= 180.0750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 180.0750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1666 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4166 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3541 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4515	0.4426	0.4338	0.3895	0.3807	0.3364	0.3364	0.3275	0.3541	0.3807	0.3984	0.4161 (22b)
Effective ac	0.6019	0.5980	0.5941	0.5759	0.5725	0.5566	0.5566	0.5536	0.5627	0.5725	0.5793	0.5866 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			12.3500	1.3258	16.3731		(27)					
External Wall	39.7500	12.3500	27.4000	0.1800	4.9320		(29a)					
Corridor	10.1800	1.8900	8.2900	0.1800	1.4922		(29a)					
Total net area of external elements Aum(A, m2)			49.9300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.6873		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.2448 (36)					
Total fabric heat loss						(33) + (36) =	29.9321 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 35.7690	Feb 35.5338	Mar 35.3033	Apr 34.2205	May 34.0179	Jun 33.0748	Jul 33.0748	Aug 32.9002	Sep 33.4381	Oct 34.0179	Nov 34.4277	Dec 34.8562 (38)
Heat transfer coeff	65.7011	65.4659	65.2354	64.1526	63.9500	63.0069	63.0069	62.8323	63.3702	63.9500	64.3598	64.7883 (39)
Average = Sum(39)m / 12 =												64.1516 (39)
HLP	Jan 0.9121	Feb 0.9089	Mar 0.9057	Apr 0.8906	May 0.8878	Jun 0.8747	Jul 0.8747	Aug 0.8723	Sep 0.8798	Oct 0.8878	Nov 0.8935	Dec 0.8995 (40)
HLP (average)												0.8906 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2944 (42)
Average daily hot water use (litres/day)												88.6916 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.5607	94.0131	90.4654	86.9177	83.3701	79.8224	79.8224	83.3701	86.9177	90.4654	94.0131	97.5607 (44)
Energy conte	144.6798	126.5378	130.5757	113.8391	109.2313	94.2583	87.3442	100.2287	101.4258	118.2020	129.0267	140.1146 (45)
Energy content (annual)										Total = Sum(45)m =		1395.4639 (45)
Distribution loss (46)m = 0.15 x (45)m	21.7020	18.9807	19.5864	17.0759	16.3847	14.1387	13.1016	15.0343	15.2139	17.7303	19.3540	21.0172 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	191.2747	168.6236	177.1706	158.9309	155.8262	139.3501	133.9391	146.8236	146.5176	164.7969	174.1185	186.7095 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	191.2747	168.6236	177.1706	158.9309	155.8262	139.3501	133.9391	146.8236	146.5176	164.7969	174.1185	186.7095 (64)
	85.3819	75.7424	80.6923	73.9250	73.5953	67.4144	66.3179	70.6020	69.7975	76.5781	78.9748	83.8640 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5438	16.4704	13.3947	10.1406	7.5802	6.3996	6.9149	8.9883	12.0641	15.3181	17.8785	19.0592	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9878	204.0838	198.8019	187.5575	173.3634	160.0230	151.1107	149.0147	154.2966	165.5410	179.7351	193.0756	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	(71)
Water heating gains (Table 5)	114.7607	112.7119	108.4575	102.6736	98.9185	93.6311	89.1369	94.8951	96.9410	102.9275	109.6873	112.7205	(72)
Total internal gains	395.7080	393.6819	381.0698	360.7874	340.2778	320.4693	307.5783	313.3139	323.7174	344.2024	367.7166	385.2710	(73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Southwest			5.8800		36.7938		0.6300		0.7000		0.7700		66.1187 (79)
West			3.9200		19.6403		0.6300		0.7000		0.7700		23.5291 (80)
Northwest			2.5500		11.2829		0.6300		0.7000		0.7700		8.7929 (81)
Solar gains	98.4407	176.5508	262.1463	354.4454	420.5353	426.9027	407.7337	357.6112	294.3091	200.9633	119.5968		83.1138 (83)
Total gains	494.1487	570.2327	643.2161	715.2328	760.8132	747.3720	715.3120	670.9251	618.0265	545.1657	487.3134		468.3847 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.1340	76.4075	76.6775	77.9717	78.2187	79.3894	79.3894	79.6101	78.9343	78.2187	77.7206	77.2066	
alpha	6.0756	6.0938	6.1118	6.1981	6.2146	6.2926	6.2926	6.3073	6.2623	6.2146	6.1814	6.1471	
util living area	0.9957	0.9890	0.9676	0.8937	0.7373	0.5344	0.3870	0.4296	0.6817	0.9312	0.9892	0.9968	(86)
MIT	20.1752	20.3317	20.5585	20.8125	20.9537	20.9947	20.9994	20.9989	20.9781	20.7845	20.4357	20.1508	(87)
Th 2	20.1572	20.1600	20.1627	20.1755	20.1779	20.1890	20.1890	20.1911	20.1847	20.1779	20.1730	20.1680	(88)
util rest of house	0.9943	0.9856	0.9580	0.8659	0.6853	0.4690	0.3160	0.3547	0.6113	0.9062	0.9853	0.9958	(89)
MIT 2	19.0583	19.2872	19.6128	19.9669	20.1362	20.1857	20.1888	20.1907	20.1690	19.9403	19.4494	19.0312	(90)
Living area fraction									fLA = Living area / (4) =			0.3762	(91)
MIT	19.4785	19.6802	19.9686	20.2851	20.4438	20.4901	20.4938	20.4947	20.4734	20.2579	19.8205	19.4524	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4785	19.6802	19.9686	20.2851	20.4438	20.4901	20.4938	20.4947	20.4734	20.2579	19.8205	19.4524	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	490.6249	560.6724	614.4704	622.2038	534.6411	368.8203	245.1432	256.9055	393.6713	495.5482	479.1311	465.8693	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	997.2450	967.5969	878.6310	730.3805	559.1638	371.1163	245.3351	257.2815	403.8865	617.6215	818.6890	988.1775	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	376.9254	273.4533	196.5355	77.8872	18.2449	0.0000	0.0000	0.0000	0.0000	90.8225	244.4817	388.5973	(98)
Space heating												1666.9477	(98)
Space heating per m2												23.1424	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1782.8318 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	376.9254	273.4533	196.5355	77.8872	18.2449	0.0000	0.0000	0.0000	0.0000	90.8225	244.4817	388.5973	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	403.1287	292.4634	210.1984	83.3018	19.5133	0.0000	0.0000	0.0000	0.0000	97.1364	261.4777	415.6120	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	191.2747	168.6236	177.1706	158.9309	155.8262	139.3501	133.9391	146.8236	146.5176	164.7969	174.1185	186.7095	(64)
Efficiency of water heater (217)m	86.5915	86.0966	85.0909	83.0286	80.8013	79.8000	79.8000	79.8000	79.8000	83.2993	85.7192	79.8000	(216)
Fuel for water heating, kWh/month	220.8932	195.8539	208.2134	191.4171	192.8511	174.6242	167.8435	183.9895	183.6060	197.8371	203.1267	215.2866	(219)
Water heating fuel used												2335.5422	(219)
Annual totals kWh/year													
Space heating fuel - main system												1782.8318	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												327.4893	(232)
Total delivered energy for all uses												4520.8633	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1782.8318	0.2160	385.0917 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2335.5422	0.2160	504.4771 (264)
Space and water heating			889.5688 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	327.4893	0.5190	169.9670 (268)
Total CO2, kg/m2/year			1098.4607 (272)
Emissions per m2 for space and water heating			12.3500 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3597 (272b)
Emissions per m2 for pumps and fans			0.5404 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.3500 * 1.55) + 2.3597 + 0.5404, rounded to 2 d.p.			22.0400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010502			Issued on Date	29/04/2022
Assessment Reference	010	Prop Type Ref			
Property					
SAP Rating	84 B	DER	12.56	TER	23.63
Environmental	91 B	% DER<TER	46.84		
CO ₂ Emissions (t/year)	0.71	DFEE	34.34	TFEE	40.29
General Requirements Compliance	Fail	% DFEE<TFEE	14.77		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 70 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 23.63 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.56 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)40.3 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)34.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing North:	1.37 m ² , No overhang
Windows facing North East:	8.98 m ² , No overhang
Windows facing North West:	6.24 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	353.11 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	69.9600 (1b)	x 2.5000 (2b)	= 174.9000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.9000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			16.5900	1.1450	18.9962		(27)
External Wall	37.2300	16.5900	20.6400	0.1500	3.0960		(29a)
Corridor	5.6000	1.8900	3.7100	0.2500	0.9275		(29a)
Total net area of external elements Aum(A, m ²)				42.8300			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.9097		(33)
Party Wall				39.7800	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K	250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	7.1180 (36)
Total fabric heat loss	(33) + (36) = 32.0277 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 16.1644	Feb 15.9804	Mar 15.7964	Apr 14.8766	May 14.6926	Jun 13.7727	Jul 13.7727	Aug 13.5887	Sep 14.1407	Oct 14.6926	Nov 15.0605	Dec 15.4285 (38)
Heat transfer coeff	48.1921	48.0081	47.8241	46.9042	46.7203	45.8004	45.8004	45.6164	46.1683	46.7203	47.0882	47.4562 (39)
Average = Sum(39)m / 12 =												46.8582 (39)

HLP	Jan 0.6889	Feb 0.6862	Mar 0.6836	Apr 0.6704	May 0.6678	Jun 0.6547	Jul 0.6547	Aug 0.6520	Sep 0.6599	Oct 0.6678	Nov 0.6731	Dec 0.6783 (40)
HLP (average)												0.6698 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2452 (42)
Average daily hot water use (litres/day)	87.5224 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.2746	92.7737	89.2728	85.7719	82.2710	78.7702	78.7702	82.2710	85.7719	89.2728	92.7737	96.2746 (44)
Energy conte	142.7725	124.8697	128.8544	112.3384	107.7913	93.0157	86.1928	98.9074	100.0887	116.6437	127.3258	138.2675 (45)
Energy content (annual)												Total = Sum(45)m = 1377.0680 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.4159	18.7305	19.3282	16.8508	16.1687	13.9524	12.9289	14.8361	15.0133	17.4966	19.0989	20.7401 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (56)													
If cylinder contains dedicated solar storage													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (57)													
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month													
198.0493 174.7972 184.1312 165.8321 163.0681 146.5094 141.4696 154.1842 153.5824 171.9205 180.8194 193.5443 (62)													
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
198.0493 174.7972 184.1312 165.8321 163.0681 146.5094 141.4696 154.1842 153.5824 171.9205 180.8194 193.5443 (64)													
Total per year (kWh/year) = Sum(64)m =													2027.9078 (64)
Heat gains from water heating, kWh/month													
91.6933 81.4611 87.0655 80.1475 80.0621 73.7227 72.8805 77.1082 76.0744 83.0055 85.1308 90.1954 (65)													

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)													
(66)m 112.2577 112.2577 112.2577 112.2577 112.2577 112.2577 112.2577 112.2577 112.2577 112.2577 112.2577 112.2577 112.2577 (66)													
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
17.5809 15.6152 12.6991 9.6140 7.1866 6.0672 6.5559 8.5216 11.4376 14.5227 16.9501 18.0695 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
197.2037 199.2500 194.0933 183.1152 169.2573 156.2328 147.5316 145.4853 150.6420 161.6202 175.4781 188.5025 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.2258 34.2258 34.2258 34.2258 34.2258 34.2258 34.2258 34.2258 34.2258 34.2258 34.2258 34.2258 34.2258 (69)													
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													
-89.8061 -89.8061 -89.8061 -89.8061 -89.8061 -89.8061 -89.8061 -89.8061 -89.8061 -89.8061 -89.8061 -89.8061 -89.8061 (71)													
Water heating gains (Table 5)													
123.2437 121.2219 117.0236 111.3159 107.6103 102.3926 97.9577 103.6400 105.6589 111.5665 118.2372 121.2304 (72)													
Total internal gains													
394.7055 392.7644 380.4932 360.7224 340.7315 321.3699 308.7225 314.3242 324.4159 344.3867 367.3426 384.4797 (73)													

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North					1.3700	10.6334		0.4000	0.8000	0.7700	3.2305 (74)	
Northeast					8.9800	11.2829		0.4000	0.8000	0.7700	22.4689 (75)	
Northwest					6.2400	11.2829		0.4000	0.8000	0.7700	15.6131 (81)	
Solar gains	41.3126	83.6908	150.1518	246.2144	331.0093	352.9914	330.1712	263.1292	182.7925	102.0811	51.9024	33.7928 (83)
Total gains	436.0181	476.4553	530.6451	606.9369	671.7408	674.3613	638.8937	577.4534	507.2084	446.4677	419.2450	418.2725 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	100.8119	101.1982	101.5875	103.5798	103.9877	106.0762	106.0762	106.5040	105.2308	103.9877	103.1751	102.3752
alpha	7.7208	7.7465	7.7725	7.9053	7.9325	8.0717	8.0717	8.1003	8.0154	7.9325	7.8783	7.8250
util living area	0.9959	0.9908	0.9676	0.8557	0.6395	0.4344	0.3154	0.3633	0.6224	0.9218	0.9890	0.9969 (86)
MIT	20.4569	20.5589	20.7359	20.9291	20.9927	20.9997	21.0000	20.9999	20.9957	20.8906	20.6473	20.4415 (87)
Th 2	20.3507	20.3530	20.3553	20.3670	20.3694	20.3811	20.3811	20.3834	20.3764	20.3694	20.3647	20.3600 (88)
util rest of house	0.9947	0.9882	0.9587	0.8273	0.5986	0.3925	0.2710	0.3147	0.5685	0.8976	0.9854	0.9960 (89)
MIT 2	19.6213	19.7709	20.0247	20.2900	20.3630	20.3809	20.3810	20.3834	20.3733	20.2493	19.9093	19.6066 (90)
Living area fraction									fLA = Living area / (4) =			0.3616 (91)
MIT	19.9235	20.0559	20.2819	20.5212	20.5907	20.6047	20.6049	20.6063	20.5984	20.4812	20.1762	19.9085 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9235	20.0559	20.2819	20.5212	20.5907	20.6047	20.6049	20.6063	20.5984	20.4812	20.1762	19.9085 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.9937 0.9867 0.9575 0.8346 0.6131 0.4076 0.2871 0.3323 0.5879 0.9023 0.9840 0.9952 (94)												
Useful gains	433.2913	470.1090	508.0998	506.5296	411.8289	274.8990	183.4193	191.8614	298.1829	402.8558	412.5481	416.2650 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	752.9298	727.6041	659.1054	545.0816	415.3778	275.0159	183.4248	191.8785	300.0211	461.6542	615.7340	745.4660 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	237.8110	173.0367	112.3481	27.7574	2.6403	0.0000	0.0000	0.0000	0.0000	43.7461	146.2939	244.9255 (98)
Space heating												988.5590 (98)
Space heating per m2										(98) / (4) =		14.1303 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	988.5590 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1108.1747 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	58.3250 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2027.9078 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2273.2846 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	119.6466 (310b)
Electricity used for heat distribution	35.5943 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	168.0352 (330a)
Total electricity for the above, kWh/year	168.0352 (331)
Electricity for lighting (calculated in Appendix L)	310.4834 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	4037.9494 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1352.5837	0.5190	701.9910 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	179.7692	0.5190	93.3002 (368)
Electrical energy for heat distribution	35.5943	0.5190	18.4734 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			813.7646 (373)
Space and water heating			813.7646 (376)
Pumps and fans	168.0352	0.5190	87.2103 (378)
Energy for lighting	310.4834	0.5190	161.1409 (379)
Energy saving/generation technologies			
PV Unit	-353.1100	0.5190	-183.2641 (380)
Total CO2, kg/year			878.8517 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			12.5600 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		12.5600 ZC1
Total Floor Area	TFA	69.9600
Assumed number of occupants	N	2.2452
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.7037 ZC2
CO2 emissions from cooking, equation (L16)		2.4712 ZC3
Total CO2 emissions		31.7348 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		31.7348 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	69.9600 (1b)	x 2.5000 (2b)	= 174.9000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.9000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) = 0.1144 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3644 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3097 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.3949	0.3871	0.3794	0.3407	0.3329	0.2942	0.2942	0.2865	0.3097	0.3329	0.3484	0.3639 (22b)
Effective ac	0.5780	0.5749	0.5720	0.5580	0.5554	0.5433	0.5433	0.5410	0.5480	0.5554	0.5607	0.5662 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			15.6200	1.3258	20.7083		(27)					
External Wall	37.2300	15.6200	21.6100	0.1800	3.8898		(29a)					
Corridor	5.6000	1.8900	3.7100	0.1800	0.6678		(29a)					
Total net area of external elements Aum(A, m2)			42.8300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.1559		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.3022 (36)					
Total fabric heat loss						(33) + (36) =	32.4581 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 33.3581	Feb 33.1834	Mar 33.0121	Apr 32.2077	May 32.0572	Jun 31.3565	Jul 31.3565	Aug 31.2268	Sep 31.6264	Oct 32.0572	Nov 32.3616	Dec 32.6799 (38)
Heat transfer coeff	65.8162	65.6415	65.4702	64.6658	64.5153	63.8147	63.8147	63.6849	64.0845	64.5153	64.8198	65.1381 (39)
Average = Sum(39)m / 12 =												64.6651 (39)
HLP	Jan 0.9408	Feb 0.9383	Mar 0.9358	Apr 0.9243	May 0.9222	Jun 0.9122	Jul 0.9122	Aug 0.9103	Sep 0.9160	Oct 0.9222	Nov 0.9265	Dec 0.9311 (40)
HLP (average)												0.9243 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2452 (42)
Average daily hot water use (litres/day)													87.5224 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	96.2746	92.7737	89.2728	85.7719	82.2710	78.7702	78.7702	82.2710	85.7719	89.2728	92.7737	96.2746	(44)
Energy content (annual)	142.7725	124.8697	128.8544	112.3384	107.7913	93.0157	86.1928	98.9074	100.0887	116.6437	127.3258	138.2675	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1377.0680	(45)
	21.4159	18.7305	19.3282	16.8508	16.1687	13.9524	12.9289	14.8361	15.0133	17.4966	19.0989	20.7401	(46)
Water storage loss:													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.3938 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7527 (55)
Total storage loss													

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	189.3674	166.9555	175.4493	157.4302	154.3862	138.1076	132.7877	145.5023	145.1806	163.2386	172.4176	184.8624 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	189.3674	166.9555	175.4493	157.4302	154.3862	138.1076	132.7877	145.5023	145.1806	163.2386	172.4176	184.8624 (64)
	84.7478	75.1878	80.1200	73.4260	73.1165	67.0012	65.9350	70.1626	69.3530	76.0600	78.4093	83.2499 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.5804	15.6147	12.6988	9.6138	7.1864	6.0671	6.5557	8.5213	11.4373	14.5223	16.9497	18.0690	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.2037	199.2500	194.0933	183.1152	169.2573	156.2328	147.5316	145.4853	150.6420	161.6202	175.4781	188.5025	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	(71)
Water heating gains (Table 5)	113.9083	111.8866	107.6882	101.9805	98.2749	93.0572	88.6223	94.3046	96.3236	102.2311	108.9018	111.8950	(72)
Total internal gains	388.3697	386.4286	374.1575	354.3868	334.3959	315.0344	302.3870	307.9885	318.0802	338.0509	361.0068	378.1438	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				1.2900	10.6334	0.6300	0.7000	0.7700	4.1921 (74)			
Northeast				8.4600	11.2829	0.6300	0.7000	0.7700	29.1719 (75)			
Northwest				5.8700	11.2829	0.6300	0.7000	0.7700	20.2410 (81)			
Solar gains	53.6050	108.5927	194.8289	319.4745	429.4998	458.0225	428.4123	341.4222	237.1817	132.4549	67.3457	43.8478 (83)
Total gains	441.9747	495.0214	568.9864	673.8613	763.8957	773.0569	730.7993	649.4108	555.2619	470.5058	428.3525	421.9916 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.8167	74.0131	74.2068	75.1299	75.3051	76.1319	76.1319	76.2870	75.8113	75.3051	74.9514	74.5852	
alpha	5.9211	5.9342	5.9471	6.0087	6.0203	6.0755	6.0755	6.0858	6.0541	6.0203	5.9968	5.9723	
util living area	0.9973	0.9941	0.9804	0.9129	0.7372	0.5231	0.3835	0.4491	0.7452	0.9615	0.9939	0.9979	(86)
MIT	20.0812	20.2115	20.4531	20.7658	20.9484	20.9943	20.9993	20.9982	20.9602	20.6939	20.3349	20.0587	(87)
Th 2	20.1330	20.1351	20.1372	20.1469	20.1487	20.1572	20.1572	20.1587	20.1539	20.1487	20.1450	20.1412	(88)
util rest of house	0.9964	0.9922	0.9740	0.8879	0.6840	0.4565	0.3104	0.3681	0.6726	0.9451	0.9916	0.9973	(89)
MIT 2	18.9031	19.0943	19.4443	19.8824	20.1024	20.1537	20.1569	20.1580	20.1241	19.7972	19.2825	18.8765	(90)
Living area fraction	19.3291	19.4983	19.8091	20.2018	20.4083	20.4577	20.4615	20.4619	20.4265	20.1215	19.6631	19.3041	(91)
MIT	19.3291	19.4983	19.8091	20.2018	20.4083	20.4577	20.4615	20.4619	20.4265	20.1215	19.6631	19.3041	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3291	19.4983	19.8091	20.2018	20.4083	20.4577	20.4615	20.4619	20.4265	20.1215	19.6631	19.3041	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	439.8936	490.2224	552.4755	599.5080	535.3886	371.4575	246.2016	258.1048	387.1426	444.3687	423.9941	420.4513	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	989.1610	958.2563	871.3503	730.8429	561.8207	373.8073	246.4229	258.6801	405.4303	614.2799	814.3358	983.8497	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	408.6550	314.5188	237.2428	94.5611	19.6654	0.0000	0.0000	0.0000	0.0000	126.4140	281.0460	419.1684	(98)
Space heating												1901.2715	(98)
Space heating per m2												27.1766	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2033.4455 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	408.6550	314.5188	237.2428	94.5611	19.6654	0.0000	0.0000	0.0000	0.0000	126.4140	281.0460	419.1684	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	437.0642	336.3837	253.7357	101.1349	21.0326	0.0000	0.0000	0.0000	0.0000	135.2021	300.5840	448.3084	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	189.3674	166.9555	175.4493	157.4302	154.3862	138.1076	132.7877	145.5023	145.1806	163.2386	172.4176	184.8624	(64)
Efficiency of water heater (217)m	86.8140	86.4791	85.6193	83.5049	80.8804	79.8000	79.8000	79.8000	79.8000	84.1417	86.1099	79.8000	(216)
Fuel for water heating, kWh/month	218.1301	193.0587	204.9178	188.5282	190.8820	173.0671	166.4006	182.3338	181.9305	194.0044	200.2297	212.6503	(219)
Water heating fuel used												2306.1331	(219)
Annual totals kWh/year													
Space heating fuel - main system												2033.4455	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												310.4750	(232)
Total delivered energy for all uses												4725.0536	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2033.4455	0.2160	439.2242 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2306.1331	0.2160	498.1248 (264)
Space and water heating			937.3490 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	310.4750	0.5190	161.1365 (268)
Total CO2, kg/m2/year			1137.4105 (272)
Emissions per m2 for space and water heating			13.3984 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3033 (272b)
Emissions per m2 for pumps and fans			0.5564 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.3984 * 1.55) + 2.3033 + 0.5564, rounded to 2 d.p.			23.6300 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010503	Issued on Date	29/04/2022
Assessment Reference	011	Prop Type Ref	
Property			
SAP Rating	85 B	DER	12.20
Environmental	91 B	TER	22.98
CO ₂ Emissions (t/year)	0.73	% DER<TER	46.92
General Requirements Compliance	Pass	DFEE	34.29
		TFEE	38.77
		% DFEE<TFEE	11.56
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 75 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 22.98 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.20 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)38.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)34.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing North East:	9.93 m ² , No overhang
Windows facing East:	2.21 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	353.11 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	74.6300 (1b)	x 2.5000 (2b)	= 186.5750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 186.5750 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							3	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.7750 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1163 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			12.1400	1.1450	13.9008		(27)					
External Wall	31.9300	12.1400	19.7900	0.1500	2.9685		(29a)					
Corridor	25.0000	1.8900	23.1100	0.2500	5.7775		(29a)					
Total net area of external elements Aum(A, m2)				56.9300			(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	24.5368		(33)					
Party Wall				41.5000	0.0000	0.0000	(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.4240 (36)					
Total fabric heat loss							(33) + (36) = 31.9608 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 16.3602	Feb 16.1813	Mar 16.0024	Apr 15.1077	May 14.9287	Jun 14.0341	Jul 14.0341	Aug 13.8551	Sep 14.3919	Oct 14.9287	Nov 15.2866	Dec 15.6445 (38)
Heat transfer coeff	48.3210	48.1421	47.9631	47.0684	46.8895	45.9948	45.9948	45.8159	46.3527	46.8895	47.2474	47.6053 (39)
Average = Sum(39)m / 12 =	47.0237 (39)											
HLP	Jan 0.6475	Feb 0.6451	Mar 0.6427	Apr 0.6307	May 0.6283	Jun 0.6163	Jul 0.6163	Aug 0.6139	Sep 0.6211	Oct 0.6283	Nov 0.6331	Dec 0.6379 (40)
HLP (average)	0.6301 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3531 (42)
Average daily hot water use (litres/day)												90.0860 (43)
Daily hot water use	Jan 99.0946	Feb 95.4911	Mar 91.8877	Apr 88.2843	May 84.6808	Jun 81.0774	Jul 81.0774	Aug 84.6808	Sep 88.2843	Oct 91.8877	Nov 95.4911	Dec 99.0946 (44)
Energy conte	146.9544	128.5272	132.6286	115.6288	110.9486	95.7402	88.7174	101.8045	103.0204	120.0603	131.0552	142.3175 (45)
Energy content (annual)												Total = Sum(45)m = 1417.4032 (45)
Distribution loss (46)m = 0.15 x (45)m												
	22.0432	19.2791	19.8943	17.3443	16.6423	14.3610	13.3076	15.2707	15.4531	18.0090	19.6583	21.3476 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (56)													
If cylinder contains dedicated solar storage													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (57)													
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month													
202.2312 178.4547 187.9054 169.1225 166.2254 149.2339 143.9942 157.0813 156.5141 175.3371 184.5489 197.5943 (62)													
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
202.2312 178.4547 187.9054 169.1225 166.2254 149.2339 143.9942 157.0813 156.5141 175.3371 184.5489 197.5943 (64)													
Total per year (kWh/year) = Sum(64)m =													2068.2430 (64)
Heat gains from water heating, kWh/month													
93.0838 82.6773 88.3205 81.2415 81.1119 74.6286 73.7200 78.0714 77.0492 84.1415 86.3708 91.5420 (65)													

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
(66)m 117.6547 117.6547 117.6547 117.6547 117.6547 117.6547 117.6547 117.6547 117.6547 117.6547 117.6547 117.6547 (66)													
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
18.8330 16.7273 13.6036 10.2988 7.6985 6.4994 7.0228 9.1285 12.2522 15.5570 18.1574 19.3564 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
207.8536 210.0105 204.5753 193.0043 178.3980 164.6701 155.4991 153.3422 158.7774 170.3484 184.9547 198.6826 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.7655 34.7655 34.7655 34.7655 34.7655 34.7655 34.7655 34.7655 34.7655 34.7655 34.7655 34.7655 (69)													
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													
-94.1238 -94.1238 -94.1238 -94.1238 -94.1238 -94.1238 -94.1238 -94.1238 -94.1238 -94.1238 -94.1238 -94.1238 (71)													
Water heating gains (Table 5)													
125.1126 123.0316 118.7103 112.8355 109.0213 103.6508 99.0860 104.9347 107.0128 113.0934 119.9594 123.0403 (72)													
Total internal gains													
410.0957 408.0659 395.1855 374.4349 353.4141 333.1167 319.9042 325.7018 336.3389 357.2953 381.3679 399.3758 (73)													

6. Solar gains

[Jan]													
Area m2													
Solar flux Table 6a W/m2													
Specific data or Table 6b													
Specific data or Table 6c													
Access factor Table 6d													
Gains W													
Northeast	9.9300	11.2829	0.4000	0.8000	0.7700	24.8459 (75)							
East	2.2100	19.6403	0.4000	0.8000	0.7700	9.6255 (76)							
Solar gains	34.4714	69.4041	122.1288	194.8695	256.5765	271.1861	254.6287	206.3297	147.0956	84.1489	43.2644	28.2059 (83)	
Total gains	444.5670	477.4699	517.3143	569.3044	609.9906	604.3027	574.5329	532.0316	483.4345	441.4442	424.6324	427.5817 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
tau 107.2544 107.6530 108.0547 110.1086 110.5288 112.6788 112.6788 113.1188 111.8088 110.5288 109.6916 108.8670													
alpha 8.1503 8.1769 8.2036 8.3406 8.3686 8.5119 8.5119 8.5413 8.4539 8.3686 8.3128 8.2578													
util living area	0.9965	0.9926	0.9758	0.8931	0.7020	0.4866	0.3522	0.3960	0.6546	0.9321	0.9904	0.9973 (86)	
MIT	20.4959	20.5826	20.7356	20.9151	20.9891	20.9995	21.0000	20.9999	20.9953	20.8941	20.6719	20.4819 (87)	
Th 2	20.3875	20.3896	20.3917	20.4025	20.4046	20.4153	20.4153	20.4175	20.4110	20.4046	20.4003	20.3960 (88)	
util rest of house	0.9955	0.9904	0.9689	0.8692	0.6613	0.4424	0.3054	0.3459	0.6017	0.9105	0.9872	0.9966 (89)	
MIT 2	19.7082	19.8359	20.0566	20.3076	20.3948	20.4151	20.4153	20.4175	20.4076	20.2869	19.9746	19.6949 (90)	
Living area fraction									fLA =	Living area / (4) =		0.3631 (91)	
MIT	19.9942	20.1071	20.3031	20.5282	20.6106	20.6273	20.6276	20.6290	20.6210	20.5073	20.2278	19.9807 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.9942	20.1071	20.3031	20.5282	20.6106	20.6273	20.6276	20.6290	20.6210	20.5073	20.2278	19.9807 (93)	

8. Space heating requirement

Utilisation	0.9946	0.9892	0.9678	0.8745	0.6756	0.4584	0.3224	0.3641	0.6208	0.9146	0.9861	0.9959 (94)	
Useful gains	442.1813	472.3277	500.6458	497.8760	412.1033	277.0266	185.2421	193.7323	300.1045	403.7382	418.7185	425.8177 (95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W	758.3598	732.0988	662.0422	547.3224	417.8154	277.2243	185.2503	193.7544	302.2680	464.5506	620.2554	751.2434 (97)	
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)	
Space heating kWh	235.2368	174.5661	120.0789	35.6015	4.2498	0.0000	0.0000	0.0000	0.0000	45.2444	145.1066	242.1167 (98)	
Space heating												1002.2009 (98)	
Space heating per m2												(98) / (4) =	13.4289 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1002.2009 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1123.4672 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	59.1299 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2068.2430 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2318.5004 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	122.0263 (310b)
Electricity used for heat distribution	36.2312 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	179.2519 (330a)
Total electricity for the above, kWh/year	179.2519 (331)
Electricity for lighting (calculated in Appendix L)	332.5970 (332)
Energy saving/generation technologies (Appendices M, N and Q)	
Total delivered energy for all uses	4134.9727 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1376.7870	0.5190	714.5525 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	182.9861	0.5190	94.9698 (368)
Electrical energy for heat distribution	36.2312	0.5190	18.8040 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			828.3262 (373)
Space and water heating			828.3262 (376)
Pumps and fans	179.2519	0.5190	93.0318 (378)
Energy for lighting	332.5970	0.5190	172.6178 (379)
Energy saving/generation technologies			
PV Unit	-353.1100	0.5190	-183.2641 (380)
Total CO2, kg/year			910.7118 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			12.2000 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		12.2000 ZC1
Total Floor Area	TFA	74.6300
Assumed number of occupants	N	2.3531
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.5040 ZC2
CO2 emissions from cooking, equation (L16)		2.3513 ZC3
Total CO2 emissions		31.0553 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		31.0553 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	74.6300 (1b)	x 2.5000 (2b)	= 186.5750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 186.5750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 30.0000 / (5) = 0.1608 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4108 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3184 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4059	0.3980	0.3900	0.3502	0.3422	0.3024	0.3024	0.2945	0.3184	0.3422	0.3582	0.3741 (22b)
Effective ac	0.5824	0.5792	0.5760	0.5613	0.5586	0.5457	0.5457	0.5434	0.5507	0.5586	0.5641	0.5700 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			12.1400	1.3258	16.0947		(27)					
External Wall	31.9300	12.1400	19.7900	0.1800	3.5622		(29a)					
Corridor	25.0000	1.8900	23.1100	0.1800	4.1598		(29a)					
Total net area of external elements Aum(A, m2)			56.9300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	25.7067		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.4558 (36)					
Total fabric heat loss						(33) + (36) =	31.1625 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 35.8572	Feb 35.6602	Mar 35.4672	Apr 34.5604	May 34.3907	Jun 33.6009	Jul 33.6009	Aug 33.4546	Sep 33.9051	Oct 34.3907	Nov 34.7339	Dec 35.0928 (38)
Heat transfer coeff	67.0197	66.8227	66.6297	65.7229	65.5532	64.7634	64.7634	64.6171	65.0676	65.5532	65.8964	66.2552 (39)
Average = Sum(39)m / 12 =												65.7220 (39)
HLP	Jan 0.8980	Feb 0.8954	Mar 0.8928	Apr 0.8806	May 0.8784	Jun 0.8678	Jul 0.8678	Aug 0.8658	Sep 0.8719	Oct 0.8784	Nov 0.8830	Dec 0.8878 (40)
HLP (average)												0.8806 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3531 (42)
Average daily hot water use (litres/day)												90.0860 (43)
Daily hot water use	99.0946	95.4911	91.8877	88.2843	84.6808	81.0774	81.0774	84.6808	88.2843	91.8877	95.4911	99.0946 (44)
Energy conte	146.9544	128.5272	132.6286	115.6288	110.9486	95.7402	88.7174	101.8045	103.0204	120.0603	131.0552	142.3175 (45)
Energy content (annual)										Total = Sum(45)m =		1417.4032 (45)
Distribution loss (46)m = 0.15 x (45)m	22.0432	19.2791	19.8943	17.3443	16.6423	14.3610	13.3076	15.2707	15.4531	18.0090	19.6583	21.3476 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	193.5493	170.6130	179.2235	160.7207	157.5435	140.8321	135.3123	148.3994	148.1122	166.6552	176.1471	188.9124 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	193.5493	170.6130	179.2235	160.7207	157.5435	140.8321	135.3123	148.3994	148.1122	166.6552	176.1471	188.9124 (64)
	86.1383	76.4039	81.3749	74.5201	74.1663	67.9071	66.7745	71.1259	70.3277	77.1960	79.6493	84.5965 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.2699	17.1154	13.9192	10.5377	7.8770	6.6501	7.1857	9.3403	12.5365	15.9179	18.5786	19.8055	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	207.8536	210.0105	204.5753	193.0043	178.3980	164.6701	155.4991	153.3422	158.7774	170.3484	184.9547	198.6826	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	(71)
Water heating gains (Table 5)	115.7772	113.6963	109.3749	103.5001	99.6859	94.3154	89.7506	95.5994	97.6774	103.7580	110.6241	113.7050	(72)
Total internal gains	404.1972	402.1185	389.1657	368.3384	347.2574	326.9321	313.7318	319.5782	330.2877	351.3208	375.4538	393.4894	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
Northeast					9.9300	11.2829	0.6300	0.7000	0.7700		34.2408 (75)	
East					2.2100	19.6403	0.6300	0.7000	0.7700		13.2651 (76)	
Solar gains	47.5059	95.6475	168.3087	268.5545	353.5944	373.7283	350.9101	284.3482	202.7161	115.9677	59.6238	38.8713 (83)
Total gains	451.7031	497.7660	557.4744	636.8930	700.8518	700.6604	664.6419	603.9264	533.0038	467.2885	435.0776	432.3607 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	77.3301	77.5580	77.7827	78.8560	79.0601	80.0242	80.0242	80.2053	79.6501	79.0601	78.6483	78.2223	
alpha	6.1553	6.1705	6.1855	6.2571	6.2707	6.3349	6.3349	6.3470	6.3100	6.2707	6.2432	6.2148	
util living area	0.9978	0.9954	0.9856	0.9380	0.7957	0.5827	0.4276	0.4894	0.7794	0.9685	0.9949	0.9983	(86)
MIT	20.1182	20.2341	20.4499	20.7382	20.9312	20.9918	20.9990	20.9978	20.9555	20.6966	20.3610	20.0994	(87)
Th 2	20.1692	20.1714	20.1736	20.1840	20.1859	20.1950	20.1950	20.1966	20.1915	20.1859	20.1820	20.1779	(88)
util rest of house	0.9970	0.9939	0.9808	0.9185	0.7465	0.5133	0.3500	0.4054	0.7104	0.9547	0.9930	0.9977	(89)
MIT 2	18.9846	19.1552	19.4692	19.8804	20.1217	20.1897	20.1946	20.1957	20.1571	19.8325	19.3489	18.9638	(90)
Living area fraction	19.3963	19.5470	19.8253	20.1919	20.4156	20.4809	20.4867	20.4870	20.4470	20.1463	19.7164	19.3762	(91)
Temperature adjustment	19.3963	19.5470	19.8253	20.1919	20.4156	20.4809	20.4867	20.4870	20.4470	20.1463	19.7164	19.3762	(92)
adjusted MIT	19.3963	19.5470	19.8253	20.1919	20.4156	20.4809	20.4867	20.4870	20.4470	20.1463	19.7164	19.3762	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9961	0.9924	0.9783	0.9188	0.7611	0.5383	0.3782	0.4360	0.7336	0.9539	0.9916	0.9970	(94)
Ext temp.	449.9506	493.9646	545.3883	585.1472	533.4380	377.1712	251.3810	263.3056	390.9856	445.7547	431.4046	431.0583	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1011.7474	978.7525	887.8617	742.1366	571.3385	380.8702	251.7146	264.0871	412.9861	625.7897	831.3767	1005.5016	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	417.9768	325.7774	254.8002	113.0324	28.1980	0.0000	0.0000	0.0000	0.0000	133.9461	287.9798	427.3858	(98)
												1989.0966	(98)
												26.6528	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2127.3760 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	417.9768	325.7774	254.8002	113.0324	28.1980	0.0000	0.0000	0.0000	0.0000	133.9461	287.9798	427.3858	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	447.0340	348.4251	272.5136	120.8902	30.1583	0.0000	0.0000	0.0000	0.0000	143.2578	307.9998	457.0972	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	193.5493	170.6130	179.2235	160.7207	157.5435	140.8321	135.3123	148.3994	148.1122	166.6552	176.1471	188.9124	(64)
Efficiency of water heater (217)m	86.8157	86.5130	85.7520	83.8956	81.2585	79.8000	79.8000	79.8000	79.8000	84.2379	86.1176	86.9272	(216)
Fuel for water heating, kWh/month	222.9427	197.2109	209.0020	191.5722	193.8794	176.4813	169.5643	185.9642	185.6043	197.8386	204.5424	217.3225	(219)
Water heating fuel used												2351.9248	(219)
Annual totals kWh/year													
Space heating fuel - main system												2127.3760	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												340.3127	(232)
Total delivered energy for all uses												4894.6136	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2127.3760	0.2160	459.5132 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2351.9248	0.2160	508.0158 (264)
Space and water heating			967.5290 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	340.3127	0.5190	176.6223 (268)
Total CO2, kg/m2/year			1183.0763 (272)
Emissions per m2 for space and water heating			12.9643 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3666 (272b)
Emissions per m2 for pumps and fans			0.5216 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.9643 * 1.55) + 2.3666 + 0.5216, rounded to 2 d.p.			22.9800 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010504			Issued on Date	29/04/2022
Assessment Reference	012	Prop Type Ref			
Property					
SAP Rating	83 B	DER	12.80	TER	25.67
Environmental	92 A	% DER<TER	50.13		
CO ₂ Emissions (t/year)	0.54	DFEE	33.49	TFEE	37.87
General Requirements Compliance	Fail	% DFEE<TFEE	11.56		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 25.67 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.80 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 37.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 33.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing North East: 6.24 m², No overhang
Windows facing East: 2.21 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 353.11 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)
External Wall	19.8500	8.4500	11.4000	0.1500	1.7100		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Total net area of external elements Aum(A, m2)			37.3500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		17.1781		(33)
Party Wall			37.0000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.3010 (36)
Total fabric heat loss						(33) + (36) =	22.4791 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	11.1341	11.0123	10.8905	10.2816	10.1599	9.5510	9.5510	9.4292	9.7945	10.1599	10.4034	10.6470 (38)
Heat transfer coeff	33.6132	33.4914	33.3696	32.7607	32.6389	32.0301	32.0301	31.9083	32.2736	32.6389	32.8825	33.1260 (39)
Average = Sum(39)m / 12 =												32.7303 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.6618	0.6594	0.6570	0.6450	0.6426	0.6306	0.6306	0.6282	0.6354	0.6426	0.6474	0.6522 (40)
HLP (average)												0.6444 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7134 (42)
Average daily hot water use (litres/day)	74.8927 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												

store volume													110.0000	(47)
b) If manufacturer declared loss factor is not known :														
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152	(51)
Volume factor from Table 2a													1.0294	(52)
Temperature factor from Table 2b													0.6000	(53)
Enter (49) or (54) in (55)													1.0327	(55)
Total storage loss														
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)	
If cylinder contains dedicated solar storage														
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)	
Total heat required for water heating calculated for each month														
	177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(62)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)	
								Solar input (sum of months) =	Sum (63)m =			0.0000	(63)	
Output from w/h														
	177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(64)	
								Total per year (kWh/year) =	Sum (64)m =			1829.1942	(64)	
Heat gains from water heating, kWh/month														
	84.8430	75.4698	80.8830	74.7574	74.8902	69.2597	68.7450	72.3625	71.2721	77.4089	79.0216	83.5613	(65)	

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.4839	11.9763	9.7398	7.3736	5.5119	4.6534	5.0281	6.5357	8.7723	11.1384	13.0002	13.8587 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	114.0363	112.3063	108.7138	103.8297	100.6589	96.1941	92.3992	97.2615	98.9891	104.0442	109.7522	112.3135 (72)
Total internal gains	325.5065	323.8179	314.0852	298.5244	283.0012	267.8182	257.8112	262.6320	270.4999	286.2317	304.2921	317.5716 (73)

[Jan]			Area m ²		Solar flux Table 6a W/m ²		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Northeast			6.2400		11.2829		0.4000		0.8000		0.7700		15.6131 (75)
East			2.2100		19.6403		0.4000		0.8000		0.7700		9.6255 (76)
Solar gains	25.2386	50.6105	88.2687	139.2616	181.8285	191.4969	180.0811	146.8995	105.8366	61.1817	31.6472		20.6660 (83)
Total gains	350.7451	374.4284	402.3539	437.7860	464.8297	459.3151	437.8922	409.5315	376.3365	347.4133	335.9393		338.2376 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil/m, (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	104.9316	105.3132	105.6975	107.6620	108.0637	110.1179	110.1179	110.5382	109.2869	108.0637	107.2633	106.4746	
alpha	7.9954	8.0209	8.0465	8.1775	8.2042	8.3412	8.3412	8.3692	8.2858	8.2042	8.1509	8.0983	
util living area													
	0.9911	0.9830	0.9530	0.8419	0.6460	0.4460	0.3218	0.3584	0.5886	0.8807	0.9771	0.9930	(86)
MIT	20.5663	20.6525	20.7960	20.9433	20.9934	20.9997	21.0000	21.0000	20.9976	20.9318	20.7378	20.5513	(87)
Th 2	20.3747	20.3768	20.3790	20.3896	20.3918	20.4025	20.4025	20.4047	20.3982	20.3918	20.3875	20.3832	(88)
util rest of house													
	0.9887	0.9784	0.9412	0.8131	0.6061	0.4045	0.2781	0.3120	0.5386	0.8506	0.9702	0.9910	(89)
MIT 2	19.7994	19.9248	20.1278	20.3286	20.3860	20.4023	20.4025	20.4046	20.3965	20.3200	20.0566	19.7849	(90)
Living area fraction									fLA = Living area / (4) =			0.5021	(91)
MIT	20.1844	20.2901	20.4632	20.6373	20.6909	20.7023	20.7025	20.7035	20.6983	20.6272	20.3986	20.1697	(92)
Temperature adjustment												0.0000	
adjusted MIT	20.1844	20.2901	20.4632	20.6373	20.6909	20.7023	20.7025	20.7035	20.6983	20.6272	20.3986	20.1697	(93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9878	0.9777	0.9430	0.8252	0.6259	0.4253	0.3001	0.3353	0.5636	0.8629	0.9703	0.9902 (94)
Useful gains	346.4661	366.0705	379.4090	361.2519	290.9326	195.3655	131.3985	137.3085	212.1206	299.7868	325.9688	334.9208 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	533.9248	515.4364	465.9477	384.5210	293.4544	195.4558	131.4026	137.3182	212.9506	327.2758	437.2908	529.0127 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	139.4693	100.3739	64.3848	16.7538	1.8762	0.0000	0.0000	0.0000	0.0000	20.4518	80.1519	144.4044 (98)
Space heating												567.8660 (98)
Space heating per m2												11.1807 (99)
										(98) / (4) =		

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	567.8660 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	636.5778 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	33.5041 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2050.5266 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	107.9225 (310b)
Electricity used for heat distribution	28.2853 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	238.1302 (332)
Energy saving/generation technologies (Appendices M, N and Q)	
Total delivered energy for all uses	3188.6525 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1074.8418	0.5190	557.8429 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	142.8551	0.5190	74.1418 (368)
Electrical energy for heat distribution	28.2853	0.5190	14.6801 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			646.6648 (373)
Space and water heating			646.6648 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	238.1302	0.5190	123.5896 (379)
Energy saving/generation technologies			
PV Unit	-353.1100	0.5190	-183.2641 (380)
Total CO2, kg/year			650.3037 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			12.8000 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		12.8000 ZC1
Total Floor Area	TFA	50.7900
Assumed number of occupants	N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.4175 ZC2
CO2 emissions from cooking, equation (L16)		3.1526 ZC3
Total CO2 emissions		33.3701 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		33.3701 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					20.0000 / (5) = 0.1575 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4075 (18)
					3 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)					
External Wall	19.8500	8.4500	11.4000	0.1800	2.0520		(29a)					
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)					
Total net area of external elements Aum(A, m2)			37.3500				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	17.9545		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.9726 (36)					
Total fabric heat loss						(33) + (36) =	21.9271 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 24.3480	Feb 24.2160	Mar 24.0867	Apr 23.4794	May 23.3658	Jun 22.8368	Jul 22.8368	Aug 22.7389	Sep 23.0406	Oct 23.3658	Nov 23.5957	Dec 23.8360 (38)
Heat transfer coeff	46.2750	46.1431	46.0138	45.4065	45.2928	44.7639	44.7639	44.6659	44.9676	45.2928	45.5227	45.7630 (39)
Average = Sum(39)m / 12 =												45.4059 (39)
HLP	Jan 0.9111	Feb 0.9085	Mar 0.9060	Apr 0.8940	May 0.8918	Jun 0.8814	Jul 0.8814	Aug 0.8794	Sep 0.8854	Oct 0.8918	Nov 0.8963	Dec 0.9010 (40)
HLP (average)												0.8940 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan 82.3820	Feb 79.3863	Mar 76.3906	Apr 73.3949	May 70.3992	Jun 67.4035	Jul 67.4035	Aug 70.3992	Sep 73.3949	Oct 76.3906	Nov 79.3863	Dec 82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

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If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
Northeast					6.2400	11.2829	0.6300	0.7000			0.7700	21.5169
East					2.2100	19.6403	0.6300	0.7000			0.7700	13.2651 (76)

Solar gains	34.7820	69.7476	121.6454	191.9199	250.5825	263.9066	248.1742	202.4459	145.8561	84.3160	43.6138	28.4803 (83)
Total gains	354.2501	387.4940	429.6097	484.2714	527.3697	525.4920	499.7608	458.8865	410.2138	364.4577	341.8569	340.0218 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	76.2201	76.4380	76.6527	77.6780	77.8729	78.7931	78.7931	78.9659	78.4360	77.8729	77.4796	77.0728
alpha	6.0813	6.0959	6.1102	6.1785	6.1915	6.2529	6.2529	6.2644	6.2291	6.1915	6.1653	6.1382
util living area	0.9953	0.9909	0.9747	0.9088	0.7488	0.5395	0.3934	0.4461	0.7191	0.9451	0.9895	0.9963 (86)
MIT	20.1876	20.3057	20.5192	20.7880	20.9489	20.9942	20.9993	20.9986	20.9703	20.7544	20.4291	20.1670 (87)
Th 2	20.1581	20.1603	20.1624	20.1726	20.1745	20.1834	20.1834	20.1850	20.1800	20.1745	20.1707	20.1666 (88)
util rest of house	0.9938	0.9880	0.9669	0.8834	0.6970	0.4732	0.3208	0.3680	0.6477	0.9238	0.9858	0.9951 (89)
MIT 2	19.0771	19.2501	19.5579	19.9338	20.1283	20.1798	20.1831	20.1844	20.1581	19.8989	19.4380	19.0536 (90)
Living area fraction	19.6346	19.7801	20.0406	20.3626	20.5403	20.5887	20.5929	20.5932	20.5658	20.3284	19.9356	19.6126 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6346	19.7801	20.0406	20.3626	20.5403	20.5887	20.5929	20.5932	20.5658	20.3284	19.9356	19.6126 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9926	0.9864	0.9655	0.8897	0.7207	0.5064	0.3573	0.4073	0.6824	0.9283	0.9844	0.9941 (94)
Useful gains	351.6359	382.2403	414.7963	430.8673	380.0823	266.1096	178.5526	186.8875	279.9332	338.3293	336.5361	338.0124 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	709.6104	686.6128	623.0524	520.4780	400.4024	268.0769	178.7380	187.2924	290.7535	440.6267	584.3111	705.3274 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	266.3331	204.5383	154.9426	64.5197	15.1182	0.0000	0.0000	0.0000	0.0000	76.1093	178.3980	273.2823 (98)
Space heating												1233.2414 (98)
Space heating per m2										(98) / (4) =		24.2812 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1318.9747 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	266.3331	204.5383	154.9426	64.5197	15.1182	0.0000	0.0000	0.0000	0.0000	76.1093	178.3980	273.2823	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	284.8482	218.7575	165.7140	69.0050	16.1692	0.0000	0.0000	0.0000	0.0000	81.4003	190.8000	292.2805	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	86.0259	85.6605	84.7812	82.8727	80.7374	79.8000	79.8000	79.8000	79.8000	83.1631	85.2060	86.1526	(216)
Fuel for water heating, kWh/month	196.1793	173.8684	185.0120	170.4054	171.9547	156.2471	150.8144	164.4484	163.8315	176.0477	180.7903	191.4164	(219)
Water heating fuel used												2081.0156	(219)
Annual totals kWh/year													
Space heating fuel - main system												1318.9747	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												3718.3666	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1318.9747	0.2160	284.8985 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2081.0156	0.2160	449.4994 (264)
Space and water heating			734.3979 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			899.6352 (272)
Emissions per m2 for space and water heating			14.4595 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.4595 * 1.55) + 2.4870 + 0.7664, rounded to 2 d.p.			25.6700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010505				Issued on Date	29/04/2022
Assessment Reference	013		Prop Type Ref			
Property						
SAP Rating	85 B	DER	11.71	TER	21.18	
Environmental	91 B	% DER<TER	44.72			
CO ₂ Emissions (t/year)	0.82	DFEE	33.02	TFEE	37.84	
General Requirements Compliance	Fail	% DFEE<TFEE	12.73			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 88 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 21.18 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 11.71 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)37.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)33.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing North East:	12.71 m ² , No overhang
Windows facing East:	1.37 m ² , No overhang
Windows facing South East:	7.38 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	353.11 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	87.5200 (1b)	x 2.5000 (2b)	= 218.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 218.8000 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							2	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1275 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m2		Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door				1.8900	1.0000	1.8900			(26)				
Window (Uw = 1.20)				21.4600	1.1450	24.5725			(27)				
External Wall	45.5300		21.4600	24.0700	0.1500	3.6105			(29a)				
Corridor	10.9800		1.8900	9.0900	0.2500	2.2725			(29a)				
Total net area of external elements Aum(A, m2)				56.5100					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =		32.3455			(33)				
Party Wall				39.6000	0.0000	0.0000			(32)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K									250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)									8.8400 (36)				
Total fabric heat loss							(33) + (36) =	41.1855	(37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 20.2216	Feb 19.9915	Mar 19.7613	Apr 18.6106	May 18.3804	Jun 17.2297	Jul 17.2297	Aug 16.9995	Sep 17.6900	Oct 18.3804	Nov 18.8407	Dec 19.3010	(38)
Heat transfer coeff													
	61.4072	61.1770	60.9469	59.7961	59.5659	58.4152	58.4152	58.1850	58.8755	59.5659	60.0263	60.4866	(39)
Average = Sum(39)m / 12 =													59.7386 (39)
HLP	Jan 0.7016	Feb 0.6990	Mar 0.6964	Apr 0.6832	May 0.6806	Jun 0.6674	Jul 0.6674	Aug 0.6648	Sep 0.6727	Oct 0.6806	Nov 0.6859	Dec 0.6911	(40)
HLP (average)													0.6826 (40)
Days in month													
	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5902 (42)
Average daily hot water use (litres/day)												95.7180 (43)
Daily hot water use	Jan 105.2898	Feb 101.4611	Mar 97.6323	Apr 93.8036	May 89.9749	Jun 86.1462	Jul 86.1462	Aug 89.9749	Sep 93.8036	Oct 97.6323	Nov 101.4611	Dec 105.2898 (44)
Energy conte	156.1417	136.5625	140.9203	122.8577	117.8849	101.7257	94.2638	108.1691	109.4610	127.5662	139.2485	151.2149 (45)
Energy content (annual)												Total = Sum(45)m = 1506.0165 (45)
Distribution loss (46)m = 0.15 x (45)m												
	23.4213	20.4844	21.1380	18.4287	17.6827	15.2589	14.1396	16.2254	16.4192	19.1349	20.8873	22.6822 (46)
Water storage loss:												

store volume													110.0000	(47)
b) If manufacturer declared loss factor is not known :														
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152	(51)
Volume factor from Table 2a													1.0294	(52)
Temperature factor from Table 2b													0.6000	(53)
Enter (49) or (54) in (55)													1.0327	(55)
Total storage loss														
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)	
If cylinder contains dedicated solar storage														
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)	
Total heat required for water heating calculated for each month														
	211.4185	186.4900	196.1971	176.3514	173.1617	155.2194	149.5406	163.4459	162.9547	182.8430	192.7422	206.4917	(62)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)	
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)	
Output from w/h														
	211.4185	186.4900	196.1971	176.3514	173.1617	155.2194	149.5406	163.4459	162.9547	182.8430	192.7422	206.4917	(64)	
								Total per year (kWh/year) = Sum(64)m =				2156.8562	(64)	
Heat gains from water heating, kWh/month														
	96.1386	85.3490	91.0774	83.6451	83.4182	76.6187	75.5642	80.1877	79.1907	86.6372	89.0951	94.5004	(65)	

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.9005	18.5637	15.0970	11.4294	8.5436	7.2129	7.7938	10.1306	13.5973	17.2649	20.1507	21.4814 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	234.4405	236.8732	230.7428	217.6917	201.2171	185.7333	175.3892	172.9564	179.0869	192.1379	208.6125	224.0963 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092 (71)
Water heating gains (Table 5)	129.2185	127.0074	122.4159	116.1738	112.1212	106.4149	101.5647	107.7791	109.9871	116.4479	123.7432	127.0167 (72)
Total internal gains	446.4130	444.2978	430.1091	407.1484	383.7354	361.2145	346.6011	352.7196	364.5248	387.7042	414.3599	434.4479 (73)

[Jan]			Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				
Northeast			12.7100	11.2829	0.4000	0.8000	0.7700	31.8018 (75)				
East			1.3700	19.6403	0.4000	0.8000	0.7700	5.9669 (77)				
Southeast			7.3800	36.7938	0.4000	0.8000	0.7700	60.2164 (76)				
Solar gains	97.9851	178.9767	276.1939	393.4643	486.5955	503.0205	476.6833	404.3119	316.4320	206.3224	119.5802	82.4105 (83)
Total gains	544.3980	623.2745	706.3030	800.6127	870.3309	864.2350	823.2844	757.0316	680.9567	594.0265	533.9401	516.8584 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil/m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	98.9751	99.3474	99.7226	101.6417	102.0344	104.0445	104.0445	104.4560	103.2310	102.0344	101.2520	100.4815
alpha	7.5983	7.6232	7.6482	7.7761	7.8023	7.9363	7.9363	7.9637	7.8821	7.8023	7.7501	7.6988
util living area												
	0.9962	0.9886	0.9577	0.8365	0.6296	0.4323	0.3122	0.3535	0.5924	0.9041	0.9884	0.9973 (86)
MIT	20.4354	20.5688	20.7576	20.9368	20.9929	20.9997	21.0000	20.9999	20.9967	20.9033	20.6406	20.4137 (87)
Th 2	20.3394	20.3417	20.3440	20.3557	20.3580	20.3697	20.3697	20.3720	20.3650	20.3580	20.3533	20.3487 (88)
util rest of house												
	0.9950	0.9853	0.9467	0.8063	0.5884	0.3898	0.2675	0.3053	0.5397	0.8765	0.9846	0.9965 (89)
MIT 2	19.5808	19.7757	20.0441	20.2879	20.3519	20.3695	20.3697	20.3720	20.3627	20.2539	19.8901	19.5568 (90)
Living area fraction												
	19.7400	19.9234	20.1770	20.4088	20.4712	20.4868	20.4871	20.4889	20.4808	20.3748	20.0298	19.7164 (91)
MIT												
Temperature adjustment												0.0000
adjusted MIT	19.7400	19.9234	20.1770	20.4088	20.4712	20.4868	20.4871	20.4889	20.4808	20.3748	20.0298	19.7164 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9937	0.9827	0.9435	0.8089	0.5958	0.3977	0.2758	0.3143	0.5494	0.8773	0.9821	0.9954 (94)
Useful gains	540.9464	612.5096	666.4109	647.6443	518.5276	343.7432	227.0573	237.8992	374.1121	521.1502	524.4002	514.4938 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	948.1241	919.0862	833.5693	688.1789	522.4676	343.8812	227.0633	237.9154	375.6701	582.2480	776.1304	938.5325 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	302.9402	206.0195	124.3658	29.1849	2.9313	0.0000	0.0000	0.0000	0.0000	45.4568	181.2458	315.4848 (98)
Space heating												1207.6290 (98)
Space heating per m2											(98) / (4) =	13.7983 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1207.6290 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1353.7521 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	71.2501 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2156.8562 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2417.8358 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	127.2545 (310b)
Electricity used for heat distribution	39.7009 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	210.2121 (330a)
Total electricity for the above, kWh/year	210.2121 (331)
Electricity for lighting (calculated in Appendix L)	369.1100 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	4549.4147 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1508.6352	0.5190	782.9817 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	200.5097	0.5190	104.0645 (368)
Electrical energy for heat distribution	39.7009	0.5190	20.6048 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			907.6510 (373)
Space and water heating			907.6510 (376)
Pumps and fans	210.2121	0.5190	109.1001 (378)
Energy for lighting	369.1100	0.5190	191.5681 (379)
Energy saving/generation technologies			
PV Unit	-353.1100	0.5190	-183.2641 (380)
Total CO2, kg/year			1025.0551 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			11.7100 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		11.7100 ZC1
Total Floor Area	TFA	87.5200
Assumed number of occupants	N	2.5902
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		15.8735 ZC2
CO2 emissions from cooking, equation (L16)		2.0700 ZC3
Total CO2 emissions		29.6534 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		29.6534 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	87.5200 (1b)	x 2.5000 (2b)	= 218.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 218.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1371 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3871 (18)
Number of sides sheltered					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3290 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4195	0.4113	0.4031	0.3619	0.3537	0.3126	0.3126	0.3044	0.3290	0.3537	0.3702	0.3866 (22b)
	0.5880	0.5846	0.5812	0.5655	0.5626	0.5489	0.5489	0.5463	0.5541	0.5626	0.5685	0.5747 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			20.0000	1.3258	26.5152		(27)
External Wall	45.5300	20.0000	25.5300	0.1800	4.5954		(29a)
Corridor	10.9800	1.8900	9.0900	0.1800	1.6362		(29a)
Total net area of external elements Aum(A, m ²)			56.5100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 34.6368		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.5990 (36)
Total fabric heat loss						(33) + (36) =	41.2358 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	42.4562	42.2095	41.9676	40.8316	40.6191	39.6297	39.6297
Heat transfer coeff	83.6920	83.4452	83.2034	82.0674	81.8548	80.8654	80.8654
Average = Sum(39)m / 12 =							
HLP	0.9563	0.9534	0.9507	0.9377	0.9353	0.9240	0.9240
HLP (average)							
Days in month	31	28	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5902 (42)
Average daily hot water use (litres/day)													95.7180 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	105.2898	101.4611	97.6323	93.8036	89.9749	86.1462	86.1462	89.9749	93.8036	97.6323	101.4611	105.2898	(44)
Energy conte	156.1417	136.5625	140.9203	122.8577	117.8849	101.7257	94.2638	108.1691	109.4610	127.5662	139.2485	151.2149	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
	23.4213	20.4844	21.1380	18.4287	17.6827	15.2589	14.1396	16.2254	16.4192	19.1349	20.8873	22.6822	(46)
Water storage loss:													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.3938 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.7527 (55)
Total storage loss													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	202.7366	178.6482	187.5152	167.9496	164.4798	146.8176	140.8587	154.7640	154.5528	174.1611	184.3404	197.8098 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	202.7366	178.6482	187.5152	167.9496	164.4798	146.8176	140.8587	154.7640	154.5528	174.1611	184.3404	197.8098 (64)
	89.1930	79.0756	84.1319	76.9237	76.4727	69.8973	68.6186	73.2422	72.4693	79.6917	82.3736	87.5549 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.9005	18.5637	15.0970	11.4294	8.5436	7.2129	7.7938	10.1306	13.5973	17.2649	20.1507	21.4814	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	234.4405	236.8732	230.7428	217.6917	201.2171	185.7333	175.3892	172.9564	179.0869	192.1379	208.6125	224.0963	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	(71)
Water heating gains (Table 5)	119.8831	117.6720	113.0805	106.8384	102.7858	97.0795	92.2294	98.4438	100.6517	107.1125	114.4078	117.6813	(72)
Total internal gains	440.0776	437.9624	423.7737	400.8130	377.4000	354.8792	340.2657	346.3842	358.1894	381.3688	408.0245	428.1125	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
Northeast					11.8500	11.2829	0.6300	0.7000			0.7700			40.8613 (75)
East					1.2800	19.6403	0.6300	0.7000			0.7700			7.6830 (76)
Southeast					6.8700	36.7938	0.6300	0.7000			0.7700			77.2509 (77)
Solar gains	125.7952	229.7908	354.6482	505.2835	624.9212	646.0304	612.1995	519.2294	406.3346	264.9111	153.5227	105.7982	(83)	
Total gains	565.8728	667.7532	778.4220	906.0965	1002.3212	1000.9095	952.4653	865.6137	764.5240	646.2798	561.5471	533.9107	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.6208	72.8355	73.0473	74.0584	74.2507	75.1592	75.1592	75.3298	74.8066	74.2507	73.8627	73.4614	
alpha	5.8414	5.8557	5.8698	5.9372	5.9500	6.0106	6.0106	6.0220	5.9871	5.9500	5.9242	5.8974	
util living area	0.9970	0.9915	0.9715	0.8920	0.7178	0.5123	0.3729	0.4273	0.6988	0.9452	0.9924	0.9978	(86)
MIT	20.0729	20.2417	20.4987	20.7937	20.9533	20.9946	20.9993	20.9985	20.9705	20.7315	20.3457	20.0445	(87)
Th 2	20.1199	20.1223	20.1246	20.1356	20.1376	20.1472	20.1472	20.1489	20.1435	20.1376	20.1335	20.1292	(88)
util rest of house	0.9960	0.9889	0.9627	0.8632	0.6638	0.4462	0.3010	0.3490	0.6253	0.9235	0.9896	0.9971	(89)
MIT 2	18.8811	19.1281	19.4980	19.9068	20.0962	20.1439	20.1469	20.1484	20.1222	19.8369	19.2890	18.8468	(90)
Living area fraction									fLA = Living area / (4) =			0.1862	(91)
MIT	19.1031	19.3355	19.6844	20.0720	20.2558	20.3023	20.3057	20.3067	20.2802	20.0035	19.4858	19.0698	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1031	19.3355	19.6844	20.0720	20.2558	20.3023	20.3057	20.3067	20.2802	20.0035	19.4858	19.0698	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9944	0.9857	0.9572	0.8609	0.6715	0.4583	0.3144	0.3636	0.6376	0.9194	0.9866	0.9959	(94)
Ext temp.	562.6971	658.1824	745.0856	780.0157	673.0856	458.7542	299.4652	314.7449	487.4354	594.1894	554.0450	531.7041	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1238.8988	1204.5768	1096.9828	916.8572	700.3367	461.1229	299.6620	315.2023	502.1211	769.7211	1019.1637	1230.2454	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	503.0941	367.1770	261.8115	98.5259	20.2748	0.0000	0.0000	0.0000	0.0000	130.5956	334.8855	519.7147	(98)
Space heating per m2												2236.0790	(98)
										(98) / (4) =		25.5493	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2391.5284 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	503.0941	367.1770	261.8115	98.5259	20.2748	0.0000	0.0000	0.0000	0.0000	130.5956	334.8855	519.7147	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	538.0685	392.7027	280.0123	105.3753	21.6843	0.0000	0.0000	0.0000	0.0000	139.6745	358.1663	555.8446	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	202.7366	178.6482	187.5152	167.9496	164.4798	146.8176	140.8587	154.7640	154.5528	174.1611	184.3404	197.8098	(64)
Efficiency of water heater (217)m	87.1438	86.6953	85.7042	83.4479	80.8490	79.8000	79.8000	79.8000	79.8000	84.0589	86.3876	79.8000	(216)
Fuel for water heating, kWh/month	232.6461	206.0645	218.7934	201.2628	203.4408	183.9819	176.5147	193.9399	193.6752	207.1895	213.3876	226.6540	(219)
Water heating fuel used												2457.5502	(219)
Annual totals kWh/year													
Space heating fuel - main system												2391.5284	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												369.1100	(232)
Total delivered energy for all uses												5293.1887	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2391.5284	0.2160	516.5701 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2457.5502	0.2160	530.8309 (264)
Space and water heating			1047.4010 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	369.1100	0.5190	191.5681 (268)
Total CO2, kg/m2/year			1277.8941 (272)
Emissions per m2 for space and water heating			11.9676 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.1888 (272b)
Emissions per m2 for pumps and fans			0.4448 (272c)
Target Carbon Dioxide Emission Rate (TER) = (11.9676 * 1.55) + 2.1888 + 0.4448, rounded to 2 d.p.			21.1800 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010506	Issued on Date	29/04/2022
Assessment Reference	014	Prop Type Ref	
Property			
SAP Rating	85 B	DER	11.48
Environmental	91 B	TER	20.38
CO ₂ Emissions (t/year)	0.81	% DER<TER	43.67
General Requirements Compliance	Pass	DFEE	31.54
		TFEE	33.84
		% DFEE<TFEE	6.81
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 87 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 20.38 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 11.48 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)33.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)31.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing South East:	1.97 m ² , No overhang
Windows facing South:	3.92 m ² , No overhang
Windows facing South West:	8.41 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	353.11 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	87.0000 (1b)	x 2.5000 (2b)	= 217.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 217.5000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			14.3000	1.1450	16.3740		(27)
External Wall	44.9800	14.3000	30.6800	0.1500	4.6020		(29a)
Corridor	15.5500	1.8900	13.6600	0.2500	3.4150		(29a)
Core	18.2300		18.2300	0.2500	4.5575		(29a)
Total net area of external elements Aum(A, m ²)			78.7600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	30.8385			(33)
Party Wall			18.8500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.7380 (36)
Total fabric heat loss							(33) + (36) = 40.5765 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	20.1015	19.8727	19.6439	18.5000	18.2712	17.1273	17.1273	16.8985	17.5849	18.2712	18.7288	19.1864 (38)
Heat transfer coeff	60.6780	60.4492	60.2205	59.0766	58.8478	57.7039	57.7039	57.4751	58.1614	58.8478	59.3053	59.7629 (39)
Average = Sum(39)m / 12 =												59.0194 (39)
HLP	0.6974	0.6948	0.6922	0.6790	0.6764	0.6633	0.6633	0.6606	0.6685	0.6764	0.6817	0.6869 (40)
HLP (average)												0.6784 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5824 (42)
Average daily hot water use (litres/day)												95.5318 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	105.0850	101.2637	97.4424	93.6211	89.7999	85.9786	85.9786	89.7999	93.6211	97.4424	101.2637	105.0850 (44)
Energy conte	155.8380	136.2969	140.6462	122.6187	117.6556	101.5278	94.0805	107.9587	109.2481	127.3181	138.9777	150.9207 (45)
Energy content (annual)												Total = Sum(45)m = 1503.0869 (45)
Distribution loss (46)m = 0.15 x (45)m	23.3757	20.4445	21.0969	18.3928	17.6483	15.2292	14.1121	16.1938	16.3872	19.0977	20.8466	22.6381 (46)

[illegible]

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.1208	18.7593	15.2561	11.5499	8.6337	7.2889	7.8759	10.2374	13.7406	17.4469	20.3631	21.7078 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	233.4490	235.8715	229.7669	216.7711	200.3661	184.9478	174.6474	172.2249	178.3295	191.3253	207.7303	223.1486 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956 (71)
Water heating gains (Table 5)	129.0827	126.8760	122.2934	116.0634	112.0187	106.3235	101.4828	107.6851	109.8888	116.3370	123.6181	126.8852 (72)
Total internal gains	445.3884	443.2426	429.0523	406.1202	382.7544	360.2961	345.7420	351.8833	363.6948	386.8451	413.4473	433.4775 (73)

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Southeast				1.9700	36.7938	0.4000	0.8000	0.7700	16.0740 (77)			
South				3.9200	46.7521	0.4000	0.8000	0.7700	40.6415 (78)			
Southwest				8.4100	36.7938	0.4000	0.8000	0.7700	68.6206 (79)			
Solar gains	125.3361	210.8266	282.1774	340.4041	373.8044	368.0651	356.0989	331.4779	302.3021	231.2365	149.6187	107.5989 (83)
Total gains	570.7245	654.0692	711.2297	746.5243	756.5588	728.3612	701.8409	683.3612	665.9969	618.0815	563.0660	541.0764 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	99.5693	99.9461	100.3258	102.2684	102.6660	104.7013	104.7013	105.1180	103.8776	102.6660	101.8739	101.0939
alpha	7.6380	7.6631	7.6884	7.8179	7.8444	7.9801	7.9801	8.0079	7.9252	7.8444	7.7916	7.7396
util living area	0.9945	0.9839	0.9539	0.8664	0.7067	0.5059	0.3617	0.3868	0.5982	0.8825	0.9832	0.9961 (86)
MIT	20.4756	20.6119	20.7707	20.9197	20.9850	20.9990	20.9999	20.9999	20.9966	20.9214	20.6805	20.4518 (87)
Th 2	20.3431	20.3454	20.3477	20.3594	20.3617	20.3734	20.3734	20.3757	20.3687	20.3617	20.3571	20.3524 (88)
util rest of house	0.9929	0.9795	0.9422	0.8388	0.6635	0.4569	0.3102	0.3344	0.5453	0.8519	0.9778	0.9950 (89)
MIT 2	19.6422	19.8402	20.0652	20.2715	20.3483	20.3728	20.3734	20.3757	20.3663	20.2788	19.9497	19.6152 (90)
Living area fraction									FLA = Living area / (4) =			0.1782 (91)
MIT	19.7907	19.9777	20.1909	20.3870	20.4618	20.4844	20.4850	20.4869	20.4786	20.3933	20.0799	19.7642 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7907	19.9777	20.1909	20.3870	20.4618	20.4844	20.4850	20.4869	20.4786	20.3933	20.0799	19.7642 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9912	0.9765	0.9390	0.8400	0.8704	0.4656	0.3194	0.3437	0.5546	0.8535	0.9749	0.9936 (94)
Useful gains	565.6949	638.6731	667.8410	627.1151	507.2150	339.1393	224.1628	234.8654	369.3873	527.5620	548.9363	537.6294 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
Month fracti	939.9424	911.4372	824.4731	678.6113	515.6099	339.5503	224.1797	234.8952	370.9875	576.3134	769.7764	930.1630 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating	278.4401	183.2975	116.5343	37.0773	6.2458	0.0000	0.0000	0.0000	0.0000	36.2719	159.0049	292.0450 (98)
Space heating												1108.9159 (98)
Space heating per m2												12.7462 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump	0.9500	(303a)
Fraction of heat from community Boilers	0.0500	(303b)
Fraction of total space heat from community Heat pump	0.9500	(304a)
Fraction of total space heat from community Boilers	0.0500	(304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.1800	(306)
Space heating:		
Annual space heating requirement	1108.9159	(98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1243.0947	(307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	65.4260	(307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	2153.9267	(64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2414.5518	(310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	127.0817	(310b)
Electricity used for heat distribution	38.5015	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	208.9631	(330a)
Total electricity for the above, kWh/year	208.9631	(331)
Electricity for lighting (calculated in Appendix L)	373.0005	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
Total delivered energy for all uses	4432.1178	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			250.0000	(367a)
Space heating from Heat pump	1463.0586	0.5190	759.3274	(367)
Efficiency of heat source Boilers			99.0000	(367b)
Space heating from Boilers	194.4522	0.5190	100.9207	(368)
Electrical energy for heat distribution	38.5015	0.5190	19.9823	(372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			880.2304	(373)
Space and water heating			880.2304	(376)
Pumps and fans	208.9631	0.5190	108.4519	(378)
Energy for lighting	373.0005	0.5190	193.5872	(379)
Energy saving/generation technologies				
PV Unit	-353.1100	0.5190	-183.2641	(380)
Total CO2, kg/year			999.0054	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			11.4800	(384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			11.4800	ZC1
Total Floor Area		TFA	87.0000	
Assumed number of occupants		N	2.5824	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			15.9008	ZC2
CO2 emissions from cooking, equation (L16)			2.0802	ZC3
Total CO2 emissions			29.4610	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			29.4610	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	87.0000 (1b)	x 2.5000 (2b)	= 217.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 217.5000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1379 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3879 (18)
Number of sides sheltered					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3297 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4204	0.4122	0.4039	0.3627	0.3545	0.3133	0.3133	0.3050	0.3297	0.3545	0.3710	0.3874 (22b)
	0.5884	0.5849	0.5816	0.5658	0.5628	0.5491	0.5491	0.5465	0.5544	0.5628	0.5688	0.5751 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			14.3000	1.3258	18.9583		(27)
External Wall	44.9800	14.3000	30.6800	0.1800	5.5224		(29a)
Corridor	15.5500	1.8900	13.6600	0.1800	2.4588		(29a)
Core	18.2300		18.2300	0.1800	3.2814		(29a)
Total net area of external elements Aum(A, m ²)			78.7600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 32.1109		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.3160 (36)
Total fabric heat loss							(33) + (36) = 39.4269 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	42.2307	41.9844	41.7430	40.6090	40.3968	39.4091	39.4091	39.2262	39.7895	40.3968	40.8260	41.2747 (38)
Heat transfer coeff	81.6577	81.4113	81.1699	80.0359	79.8237	78.8360	78.8360	78.6531	79.2165	79.8237	80.2529	80.7017 (39)
Average = Sum(39)m / 12 =												80.0349 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9386	0.9358	0.9330	0.9200	0.9175	0.9062	0.9062	0.9041	0.9105	0.9175	0.9224	0.9276 (40)
HLP (average)												0.9199 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5824 (42)
Average daily hot water use (litres/day)												95.5318 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	105.0850	101.2637	97.4424	93.6211	89.7999	85.9786	85.9786	89.7999	93.6211	97.4424	101.2637	105.0850 (44)
Energy conte	155.8380	136.2969	140.6462	122.6187	117.6556	101.5278	94.0805	107.9587	109.2481	127.3181	138.9777	150.9207 (45)
Energy content (annual)										Total = Sum(45)m =		1503.0869 (45)
Distribution loss (46)m = 0.15 x (45)m	23.3757	20.4445	21.0969	18.3928	17.6483	15.2292	14.1121	16.1938	16.3872	19.0977	20.8466	22.6381 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

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Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	202.4329	178.3826	187.2411	167.7106	164.2505	146.6197	140.6754	154.5536	154.3399	173.9130	184.0695	197.5156 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	202.4329	178.3826	187.2411	167.7106	164.2505	146.6197	140.6754	154.5536	154.3399	173.9130	184.0695	197.5156 (64)
Heat gains from water heating, kWh/month	89.0920	78.9873	84.0408	76.8442	76.3964	69.8315	68.5577	73.1722	72.3985	79.6092	82.2835	87.4571 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195 (66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.5997	19.1847	15.6020	11.8117	8.8294	7.4542	8.0545	10.4695	14.0522	17.8425	20.8248	22.2000 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	233.4490	235.8715	229.7669	216.7711	200.3661	184.9478	174.6474	172.2249	178.3295	191.3253	207.7303	223.1486 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120 (69)	
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)	
Losses e.g. evaporation (negative values) (Table 5)	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956 (71)	
Water heating gains (Table 5)	119.7474	117.5406	112.9580	106.7281	102.6833	96.9882	92.1474	98.3497	100.5534	107.0016	114.2827	117.5498 (72)	
Total internal gains	439.5320	437.3326	423.0628	400.0467	376.6147	354.1260	339.5852	345.7801	357.6709	380.9053	407.5736	427.6343 (73)	

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
Southeast					1.9700	36.7938	0.6300	0.7000	0.7700		22.1520 (77)	
South					3.9200	46.7521	0.6300	0.7000	0.7700		56.0091 (78)	
Southwest					8.4100	36.7938	0.6300	0.7000	0.7700		94.5677 (79)	
Solar gains	172.7288	290.5453	388.8757	469.1194	515.1492	507.2397	490.7488	456.8180	416.6101	318.6728	206.1932	148.2848 (83)
Total gains	612.2608	727.8780	811.9386	869.1661	891.7639	861.3657	830.3340	802.5980	774.2810	699.5780	613.7669	575.9191 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	73.9877	74.2116	74.4323	75.4870	75.6876	76.6359	76.6359	76.8141	76.2678	75.6876	75.2828	74.8642	
alpha	5.9325	5.9474	5.9622	6.0325	6.0458	6.1091	6.1091	6.1209	6.0845	6.0458	6.0189	5.9909	
util living area	0.9952	0.9863	0.9633	0.8998	0.7690	0.5763	0.4166	0.4489	0.6787	0.9202	0.9875	0.9966 (86)	
MIT	20.1531	20.3341	20.5563	20.7900	20.9362	20.9908	20.9989	20.9983	20.9762	20.7899	20.4263	20.1204 (87)	
Th 2	20.1348	20.1372	20.1396	20.1506	20.1526	20.1623	20.1623	20.1641	20.1586	20.1526	20.1485	20.1441 (88)	
util rest of house	0.9937	0.9822	0.9525	0.8725	0.7169	0.5050	0.3379	0.3683	0.6066	0.8922	0.9830	0.9955 (89)	
MIT 2	19.0090	19.2725	19.5902	19.9161	20.0942	20.1565	20.1619	20.1634	20.1416	19.9243	19.4164	18.9686 (90)	
Living area fraction	19.2129	19.4617	19.7623	20.0718	20.2442	20.3051	20.3110	20.3121	20.2902	20.0785	19.5963	19.1738 (92)	
Temperature adjustment	19.2129	19.4617	19.7623	20.0718	20.2442	20.3051	20.3110	20.3121	20.2902	20.0785	19.5963	19.1738 (92)	
adjusted MIT	19.2129	19.4617	19.7623	20.0718	20.2442	20.3051	20.3110	20.3121	20.2902	20.0785	19.5963	19.1738 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	607.0654	711.8943	768.7470	755.8795	644.6731	445.6694	292.2355	307.1626	478.7495	622.1981	600.9603	572.3427 (95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W	1217.7494	1185.4847	1076.5023	894.1435	682.0332	449.7677	292.5592	307.6997	490.3696	756.6071	1002.8635	1208.4088 (97)	
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)	
Space heating kWh	454.3489	318.2527	228.9699	99.5501	27.7959	0.0000	0.0000	0.0000	0.0000	100.0003	289.3703	473.2332 (98)	
Space heating												1991.5213 (98)	
Space heating per m2												22.8910 (99)	

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2129.9693 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	454.3489	318.2527	228.9699	99.5501	27.7959	0.0000	0.0000	0.0000	0.0000	100.0003	289.3703	473.2332	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	485.9346	340.3772	244.8876	106.4707	29.7282	0.0000	0.0000	0.0000	0.0000	106.9522	309.4870	506.1317	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	202.4329	178.3826	187.2411	167.7106	164.2505	146.6197	140.6754	154.5536	154.3399	173.9130	184.0695	197.5156	(64)
Efficiency of water heater (217)m	86.9083	86.3417	85.3515	83.4762	81.1893	79.8000	79.8000	79.8000	79.8000	83.3999	86.0159	87.0624	(216)
Fuel for water heating, kWh/month	232.9270	206.6008	219.3764	200.9081	202.3055	183.7339	176.2849	193.6762	193.4084	208.5291	213.9948	226.8667	(219)
Water heating fuel used												2458.6118	(219)
Annual totals kWh/year													
Space heating fuel - main system												2129.9693	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												381.4579	(232)
Total delivered energy for all uses												5045.0390	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2129.9693	0.2160	460.0734 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2458.6118	0.2160	531.0602 (264)
Space and water heating			991.1335 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	381.4579	0.5190	197.9766 (268)
Total CO2, kg/m2/year			1228.0352 (272)
Emissions per m2 for space and water heating			11.3923 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.2756 (272b)
Emissions per m2 for pumps and fans			0.4474 (272c)
Target Carbon Dioxide Emission Rate (TER) = (11.3923 * 1.55) + 2.2756 + 0.4474, rounded to 2 d.p.			20.3800 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010507			Issued on Date	29/04/2022
Assessment Reference	015	Prop Type Ref			
Property					
SAP Rating	84 B	DER	12.16	TER	21.89
Environmental	91 B	% DER<TER	44.45		
CO ₂ Emissions (t/year)	0.72	DFEE	33.34	TFEE	34.60
General Requirements Compliance	Pass	% DFEE<TFEE	3.65		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 21.89 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.16 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 34.6 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 33.3 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.23 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room stats OK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing South West:	12.10 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	353.11 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.1200 (1b)	x 2.5000 (2b)	= 182.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 182.8000 (5)

2. Ventilation rate

	main heating		secondary heating		other		total		m3 per hour			
Number of chimneys	0	+	0	+	0	=	0 * 40 =		0.0000 (6a)			
Number of open flues	0	+	0	+	0	=	0 * 20 =		0.0000 (6b)			
Number of intermittent fans							0 * 10 =		0.0000 (7a)			
Number of passive vents							0 * 10 =		0.0000 (7b)			
Number of flueless gas fires							0 * 40 =		0.0000 (7c)			
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =		0.0000 (8)			
Pressure test									Yes			
Measured/design AP50									3.0000			
Infiltration rate									0.1500 (18)			
Number of sides sheltered									3 (19)			
Shelter factor							(20) = 1 - [0.075 x (19)] =		0.7750 (20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =		0.1163 (21)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			12.1000	1.1450	13.8550		(27)					
External Wall	25.1000	12.1000	13.0000	0.1500	1.9500		(29a)					
Corridor	25.1000	1.8900	23.2100	0.2500	5.8025		(29a)					
Core	18.2300		18.2300	0.2500	4.5575		(29a)					
Total net area of external elements Aum(A, m2)			68.4300				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =			28.0550	(33)					
Party Wall			18.2300	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								8.1230 (36)				
Total fabric heat loss						(33) + (36) =	36.1780 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 16.0292	Feb 15.8539	Mar 15.6786	Apr 14.8020	May 14.6267	Jun 13.7501	Jul 13.7501	Aug 13.5748	Sep 14.1007	Oct 14.6267	Nov 14.9773	Dec 15.3280 (38)
Heat transfer coeff	52.2072	52.0319	51.8565	50.9800	50.8046	49.9281	49.9281	49.7527	50.2787	50.8046	51.1553	51.5059 (39)
Average = Sum(39)m / 12 =												50.9361 (39)
HLP	Jan 0.7140	Feb 0.7116	Mar 0.7092	Apr 0.6972	May 0.6948	Jun 0.6828	Jul 0.6828	Aug 0.6804	Sep 0.6876	Oct 0.6948	Nov 0.6996	Dec 0.7044 (40)
HLP (average)												0.6966 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3194 (42)
Average daily hot water use (litres/day)												89.2864 (43)
Daily hot water use	Jan 98.2150	Feb 94.6436	Mar 91.0721	Apr 87.5007	May 83.9292	Jun 80.3578	Jul 80.3578	Aug 83.9292	Sep 87.5007	Oct 91.0721	Nov 94.6436	Dec 98.2150 (44)
Energy conte	145.6501	127.3865	131.4514	114.6025	109.9639	94.8905	87.9300	100.9009	102.1060	118.9947	129.8920	141.0543 (45)
Energy content (annual)												Total = Sum(45)m = 1404.8227 (45)
Distribution loss (46)m = 0.15 x (45)m	21.8475	19.1080	19.7177	17.1904	16.4946	14.2336	13.1895	15.1351	15.3159	17.8492	19.4838	21.1581 (46)

Water storage loss:													
Store volume												110.0000 (47)	
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)	
Volume factor from Table 2a												1.0294 (52)	
Temperature factor from Table 2b												0.6000 (53)	
Enter (49) or (54) in (55)												1.0327 (55)	
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	200.9269	177.3139	186.7282	168.0962	165.2407	148.3841	143.2068	156.1777	155.5997	174.2715	183.3857	196.3311	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h	200.9269	177.3139	186.7282	168.0962	165.2407	148.3841	143.2068	156.1777	155.5997	174.2715	183.3857	196.3311	(64)
								Total per year (kWh/year) = Sum(64)m =				2055.6625	(64)
Heat gains from water heating, kWh/month	92.6501	82.2979	87.9290	80.9003	80.7844	74.3460	73.4582	77.7710	76.7452	83.7872	85.9840	91.1220	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4814	16.4151	13.3496	10.1065	7.5547	6.3780	6.8917	8.9581	12.0235	15.2666	17.8184	18.9951 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.4667	206.5884	201.2418	189.8593	175.4910	161.9869	152.9652	150.8435	156.1902	167.5726	181.9409	195.4451 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771 (71)
Water heating gains (Table 5)	124.5297	122.4672	118.1842	112.3615	108.5812	103.2584	98.7341	104.5309	106.5905	112.6172	119.4223	122.4758 (72)
Total internal gains	405.2693	403.2621	390.5670	370.1188	349.4184	329.4147	316.3824	322.1239	332.5957	353.2478	376.9730	394.7074 (73)

[Jan]				Area	Solar flux	g	FF			Access	Gains		
				m2	Table 6a	Specific data	Specific data	Specific data	factor	W			
					W/m2	or Table 6b	or Table 6c		Table 6d				
Southwest				12.1000	36.7938	0.4000	0.8000	0.7700	98.7287	(79)			
Solar gains	98.7287	168.1716	230.0997	285.1047	319.3410	317.0317	305.6524	280.1105	249.1493	185.8654	118.2543	84.4912	(83)
Total gains	503.9980	571.4337	620.6667	655.2234	668.7594	646.4463	622.0348	602.2345	581.7449	539.1133	495.2273	479.1986	(84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n _{l,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	97.2621	97.5898	97.9197	99.6034	99.9471	101.7019	101.7019	102.0602	100.9926	99.9471	99.2620	98.5863
alpha	7.4841	7.5060	7.5280	7.6402	7.6631	7.7801	7.7801	7.8040	7.7328	7.6631	7.6175	7.5724
util living area												
	0.9930	0.9813	0.9489	0.8559	0.6913	0.4933	0.3531	0.3799	0.5919	0.8755	0.9798	0.9949 (86)
MIT	20.4818	20.6134	20.7724	20.9215	20.9857	20.9991	20.9999	20.9999	20.9964	20.9210	20.6840	20.4569 (87)
Th 2	20.3285	20.3306	20.3327	20.3433	20.3454	20.3560	20.3560	20.3582	20.3518	20.3454	20.3412	20.3369 (88)
util rest of house												
	0.9909	0.9762	0.9361	0.8269	0.6475	0.4441	0.3015	0.3270	0.5382	0.8436	0.9735	0.9934 (89)
MIT 2	19.6391	19.8296	20.0539	20.2580	20.3328	20.3554	20.3560	20.3581	20.3492	20.2627	19.9410	19.6099 (90)
Living area fraction												
MIT	19.9549	20.1233	20.3231	20.5067	20.5774	20.5966	20.5973	20.5986	20.5917	20.5094	20.2194	19.9273 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9549	20.1233	20.3231	20.5067	20.5774	20.5966	20.5973	20.5986	20.5917	20.5094	20.2194	19.9273 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9895	0.9744	0.9359	0.8345	0.6633	0.4625	0.3208	0.3468	0.5582	0.8521	0.9721	0.9922 (94)
Useful gains	498.7262	556.7998	580.8575	546.7654	443.5951	298.9958	199.5582	208.8569	324.7431	459.3768	481.4041	475.4832 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	817.2962	792.0981	716.8183	591.7072	451.0155	299.3993	199.5777	208.8921	326.3954	503.4425	671.1285	810.0477 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	237.0160	158.1204	101.1548	32.3581	5.5207	0.0000	0.0000	0.0000	0.0000	32.7848	136.6016	248.9160 (98)
Space heating												
Space heating per m2												
										(98) / (4) =		13.0262 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump	0.9500	(303a)
Fraction of heat from community Boilers	0.0500	(303b)
Fraction of total space heat from community Heat pump	0.9500	(304a)
Fraction of total space heat from community Boilers	0.0500	(304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.1800	(306)
Space heating:		
Annual space heating requirement	952.4725	(98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1067.7217	(307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	56.1959	(307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	2055.6625	(64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2304.3976	(310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	121.2841	(310b)
Electricity used for heat distribution	35.4960	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	175.6251	(330a)
Total electricity for the above, kWh/year	175.6251	(331)
Electricity for lighting (calculated in Appendix L)	326.3881	(332)
Energy saving/generation technologies (Appendices M, N and Q)		
Total delivered energy for all uses	4051.6125	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1348.8477	0.5190	700.0520 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	179.2727	0.5190	93.0425 (368)
Electrical energy for heat distribution	35.4960	0.5190	18.4224 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			811.5169 (373)
Space and water heating			811.5169 (376)
Pumps and fans	175.6251	0.5190	91.1494 (378)
Energy for lighting	326.3881	0.5190	169.3954 (379)
Energy saving/generation technologies			
PV Unit	-353.1100	0.5190	-183.2641 (380)
Total CO2, kg/year			888.7977 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			12.1600 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		12.1600	ZC1
Total Floor Area		73.1200	
Assumed number of occupants		2.3194	
CO2 emission factor in Table 12 for electricity displaced from grid		0.5190	
CO2 emissions from appliances, equation (L14)		16.5704	ZC2
CO2 emissions from cooking, equation (L16)		2.3888	ZC3
Total CO2 emissions		31.1191	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		31.1191	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.1200 (1b)	x 2.5000 (2b)	= 182.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 182.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1641 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4141 (18)
Number of sides sheltered					3 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3209 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
	0.4092	0.4012	0.3931	0.3530	0.3450	0.3049	0.3049	0.2969	0.3209	0.3450	0.3611	0.3771 (22b)
Effective ac	0.5837	0.5805	0.5773	0.5623	0.5595	0.5465	0.5465	0.5441	0.5515	0.5595	0.5652	0.5711 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			12.1000	1.3258	16.0417		(27)
External Wall	25.1000	12.1000	13.0000	0.1800	2.3400		(29a)
Corridor	25.1000	1.8900	23.2100	0.1800	4.1778		(29a)
Core	18.2300		18.2300	0.1800	3.2814		(29a)
Total net area of external elements Aum(A, m ²)			68.4300				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 27.7309		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.0308 (36)
Total fabric heat loss							(33) + (36) = 33.7617 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	35.2124	35.0163	34.8240	33.9211	33.7522	32.9658	32.9658	32.8202	33.2687	33.7522	34.0939	34.4512 (38)
Heat transfer coeff	68.9740	68.7779	68.5857	67.6828	67.5139	66.7275	66.7275	66.5819	67.0304	67.5139	67.8556	68.2129 (39)
Average = Sum(39)m / 12 =												67.6820 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9433	0.9406	0.9380	0.9256	0.9233	0.9126	0.9126	0.9106	0.9167	0.9233	0.9280	0.9329 (40)
HLP (average)												0.9256 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3194 (42)
Average daily hot water use (litres/day)												89.2864 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	98.2150	94.6436	91.0721	87.5007	83.9292	80.3578	80.3578	83.9292	87.5007	91.0721	94.6436	98.2150 (44)
Energy conte	145.6501	127.3865	131.4514	114.6025	109.9639	94.8905	87.9300	100.9009	102.1060	118.9947	129.8920	141.0543 (45)
Energy content (annual)										Total = Sum(45)m =		1404.8227 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.8475	19.1080	19.7177	17.1904	16.4946	14.2336	13.1895	15.1351	15.3159	17.8492	19.4838	21.1581 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	192.2450	169.4722	178.0463	159.6944	156.5588	139.9823	134.5249	147.4958	147.1978	165.5896	174.9838	187.6492 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	192.2450	169.4722	178.0463	159.6944	156.5588	139.9823	134.5249	147.4958	147.1978	165.5896	174.9838	187.6492 (64)
Heat gains from water heating, kWh/month	85.7046	76.0246	80.9835	74.1788	73.8389	67.6245	66.5126	70.8255	70.0237	76.8417	79.2626	84.1765 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.8939	16.7814	13.6476	10.3321	7.7234	6.5204	7.0455	9.1580	12.2919	15.6074	18.2161	19.4191 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.4667	206.5884	201.2418	189.8593	175.4910	161.9869	152.9652	150.8435	156.1902	167.5726	181.9409	195.4451 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771 (71)
Water heating gains (Table 5)	115.1943	113.1318	108.8488	103.0261	99.2458	93.9230	89.3987	95.1955	97.2552	103.2818	110.0869	113.1404 (72)
Total internal gains	399.3464	397.2931	384.5296	364.0090	343.2516	323.2216	310.2009	315.9885	326.5286	347.2532	371.0353	388.7960 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
Southwest				12.1000	36.7938	0.6300	0.7000		0.7700		136.0605 (79)	
Solar gains	136.0605	231.7615	317.1061	392.9099	440.0918	436.9093	421.2272	386.0273	343.3589	256.1458	162.9692	116.4395 (83)
Total gains	535.4069	629.0545	701.6357	756.9188	783.3434	760.1309	731.4280	702.0158	669.8875	603.3990	534.0045	505.2355 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	73.6187	73.8286	74.0355	75.0232	75.2109	76.0972	76.0972	76.2637	75.7534	75.2109	74.8321	74.4402
alpha	5.9079	5.9219	5.9357	6.0015	6.0141	6.0731	6.0731	6.0842	6.0502	6.0141	5.9888	5.9627
util living area	0.9942	0.9845	0.9592	0.8886	0.7482	0.5543	0.4005	0.4347	0.6659	0.9137	0.9853	0.9958 (86)
MIT	20.1731	20.3483	20.5705	20.8040	20.9440	20.9923	20.9991	20.9985	20.9780	20.7979	20.4418	20.1403 (87)
Th 2	20.1309	20.1331	20.1353	20.1458	20.1477	20.1568	20.1568	20.1585	20.1533	20.1477	20.1438	20.1396 (88)
util rest of house	0.9924	0.9799	0.9475	0.8595	0.6952	0.4846	0.3242	0.3560	0.5939	0.8841	0.9802	0.9944 (89)
MIT 2	19.0350	19.2896	19.6062	19.9290	20.0971	20.1520	20.1565	20.1579	20.1377	19.9297	19.4347	18.9941 (90)
Living area fraction	19.4615	19.6864	19.9676	20.2569	20.4145	20.4669	20.4722	20.4729	20.4526	20.2550	19.8121	19.4236 (92)
Temperature adjustment	19.4615	19.6864	19.9676	20.2569	20.4145	20.4669	20.4722	20.4729	20.4526	20.2550	19.8121	19.4236 (93)
adjusted MIT	19.4615	19.6864	19.9676	20.2569	20.4145	20.4669	20.4722	20.4729	20.4526	20.2550	19.8121	19.4236 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9906	0.9770	0.9448	0.8637	0.7125	0.5105	0.3528	0.3856	0.6201	0.8883	0.9777	0.9930 (94)
Ext temp.	530.3520	614.5805	662.9033	653.7423	558.1012	388.0767	258.0828	270.6708	415.3845	536.0107	522.0740	501.6772 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Month fracti	1045.7481	1016.9753	923.6818	768.6651	588.3477	391.4831	258.3839	271.1818	425.8161	651.8481	862.5873	1038.4448 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating per m2	383.4547	270.4093	194.0193	82.7444	22.5034	0.0000	0.0000	0.0000	0.0000	86.1830	245.1696	399.3551 (98)
Space heating												1683.8387 (98)
Space heating per m2												23.0284 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1800.8970 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	383.4547	270.4093	194.0193	82.7444	22.5034	0.0000	0.0000	0.0000	0.0000	86.1830	245.1696	399.3551	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	410.1119	289.2078	207.5072	88.4966	24.0678	0.0000	0.0000	0.0000	0.0000	92.1744	262.2135	427.1177	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	192.2450	169.4722	178.0463	159.6944	156.5588	139.9823	134.5249	147.4958	147.1978	165.5896	174.9838	187.6492	(64)
Efficiency of water heater (217)m	86.6215	86.0545	85.0432	83.1555	81.0036	79.8000	79.8000	79.8000	79.8000	83.1658	85.7135	86.7803	(216)
Fuel for water heating, kWh/month	221.9368	196.9358	209.3598	192.0430	193.2738	175.4164	168.5775	184.8318	184.4584	199.1077	204.1497	216.2348	(219)
Water heating fuel used												2346.3256	(219)
Annual totals kWh/year													
Space heating fuel - main system												1800.8970	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												333.6730	(232)
Total delivered energy for all uses												4555.8956	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1800.8970	0.2160	388.9937 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2346.3256	0.2160	506.8063 (264)
Space and water heating			895.8001 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	333.6730	0.5190	173.1763 (268)
Total CO2, kg/m2/year			1107.9014 (272)
Emissions per m2 for space and water heating			12.2511 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3684 (272b)
Emissions per m2 for pumps and fans			0.5323 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.2511 * 1.55) + 2.3684 + 0.5323, rounded to 2 d.p.			21.8900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010508			Issued on Date	29/04/2022
Assessment Reference	016	Prop Type Ref			
Property					
SAP Rating	85 B	DER	11.43	TER	22.04
Environmental	92 A	% DER<TER	48.15		
CO ₂ Emissions (t/year)	0.68	DFEE	30.26	TFEE	34.99
General Requirements Compliance	Fail	% DFEE<TFEE	13.52		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 72 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 22.04 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 11.43 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)35.0 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)30.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing South West:	5.88 m ² , No overhang
Windows facing West:	3.92 m ² , No overhang
Windows facing North West:	2.55 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	353.11 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.0300 (1b)	x 2.5000 (2b)	= 180.0750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 180.0750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			12.3500	1.1450	14.1412		(27)
External Wall	39.7500	12.3500	27.4000	0.1500	4.1100		(29a)
Corridor	10.1800	1.8900	8.2900	0.2500	2.0725		(29a)
Total net area of external elements Aum(A, m ²)				49.9300			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.2137		(33)
Party Wall				37.2500	0.0000	0.0000	(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.0350 (36)
Total fabric heat loss							(33) + (36) = 29.2487 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	16.6426	16.4532	16.2638	15.3167	15.1273	14.1802	14.1802	13.9908	14.5591	15.1273	15.5061	15.8850 (38)
Heat transfer coeff	45.8914	45.7019	45.5125	44.5655	44.3760	43.4290	43.4290	43.2395	43.8078	44.3760	44.7549	45.1337 (39)
Average = Sum(39)m / 12 =												44.5181 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.6371	0.6345	0.6319	0.6187	0.6161	0.6029	0.6029	0.6003	0.6082	0.6161	0.6213	0.6266 (40)
HLP (average)												0.6180 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.2944 (42)
Average daily hot water use (litres/day)	88.6916 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.5607	94.0131	90.4654	86.9177	83.3701	79.8224	79.8224	83.3701	86.9177	90.4654	94.0131	97.5607 (44)
Energy conte	144.6798	126.5378	130.5757	113.8391	109.2313	94.2583	87.3442	100.2287	101.4258	118.2020	129.0267	140.1146 (45)
Energy content (annual)												Total = Sum(45)m = 1395.4639 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.7020	18.9807	19.5864	17.0759	16.3847	14.1387	13.1016	15.0343	15.2139	17.7303	19.3540	21.0172 (46)
Water storage loss:												

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Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (56)													
If cylinder contains dedicated solar storage													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (57)													
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month													
199.9566 176.4653 185.8525 167.3328 164.5081 147.7520 142.6210 155.5055 154.9194 173.4788 182.5204 195.3914 (62)													
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
199.9566 176.4653 185.8525 167.3328 164.5081 147.7520 142.6210 155.5055 154.9194 173.4788 182.5204 195.3914 (64)													
Total per year (kWh/year) = Sum(64)m =													2046.3037 (64)
Heat gains from water heating, kWh/month													
92.3275 82.0158 87.6379 80.6464 80.5408 74.1358 73.2634 77.5475 76.5190 83.5236 85.6963 90.8096 (65)													

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
(66)m 114.7191 114.7191 114.7191 114.7191 114.7191 114.7191 114.7191 114.7191 114.7191 114.7191 114.7191 114.7191 (66)													
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
18.1753 16.1432 13.1285 9.9391 7.4296 6.2724 6.7775 8.8097 11.8244 15.0137 17.5233 18.6805 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
201.9878 204.0838 198.8019 187.5575 173.3634 160.0230 151.1107 149.0147 154.2966 165.5410 179.7351 193.0756 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.4719 34.4719 34.4719 34.4719 34.4719 34.4719 34.4719 34.4719 34.4719 34.4719 34.4719 34.4719 (69)													
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													
-91.7753 -91.7753 -91.7753 -91.7753 -91.7753 -91.7753 -91.7753 -91.7753 -91.7753 -91.7753 -91.7753 -91.7753 (71)													
Water heating gains (Table 5)													
124.0961 122.0473 117.7928 112.0089 108.2538 102.9664 98.4723 104.2305 106.2764 112.2629 119.0227 122.0559 (72)													
Total internal gains													
401.6749 399.6900 387.1390 366.9213 346.4626 326.6775 313.7763 319.4707 329.8131 350.2334 373.6968 391.2276 (73)													

6. Solar gains

[Jan]												
				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d	Gains W	
Southwest				5.8800	36.7938		0.4000	0.8000		0.7700	47.9773 (79)	
West				3.9200	19.6403		0.4000	0.8000		0.7700	17.0733 (80)	
Northwest				2.5500	11.2829		0.4000	0.8000		0.7700	6.3804 (81)	
Solar gains	71.4309	128.1094	190.2195	257.1940	305.1504	309.7707	295.8612	259.4911	213.5576	145.8237	86.7822	60.3093 (83)
Total gains	473.1058	527.7994	577.3585	624.1152	651.6129	636.4482	609.6375	578.9618	543.3707	496.0571	460.4790	451.5369 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	108.9984	109.4501	109.9056	112.2413	112.7204	115.1785	115.1785	115.6831	114.1825	112.7204	111.7662	110.8281
alpha	8.2666	8.2967	8.3270	8.4828	8.5147	8.6786	8.6786	8.7122	8.6122	8.5147	8.4511	8.3885
util living area	0.9928	0.9812	0.9423	0.8187	0.6285	0.4365	0.3134	0.3435	0.5547	0.8598	0.9783	0.9947 (86)
MIT	20.5733	20.6864	20.8332	20.9592	20.9955	20.9998	21.0000	21.0000	20.9988	20.9495	20.7524	20.5545 (87)
Th 2	20.3967	20.3991	20.4014	20.4132	20.4156	20.4274	20.4274	20.4297	20.4226	20.4156	20.4108	20.4061 (88)
util rest of house	0.9908	0.9763	0.9289	0.7892	0.5907	0.3976	0.2726	0.3010	0.5090	0.8282	0.9718	0.9932 (89)
MIT 2	19.8281	19.9922	20.1982	20.3698	20.4116	20.4273	20.4274	20.4297	20.4218	20.3632	20.0976	19.8088 (90)
Living area fraction												0.3762 (91)
MIT	20.1085	20.2534	20.4371	20.5915	20.6313	20.6427	20.6428	20.6443	20.6388	20.5838	20.3439	20.0894 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1085	20.2534	20.4371	20.5915	20.6313	20.6427	20.6428	20.6443	20.6388	20.5838	20.3439	20.0894 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9896	0.9749	0.9298	0.7985	0.6047	0.4122	0.2880	0.3170	0.5262	0.8378	0.9709	0.9923 (94)	
Useful gains	468.2089	514.5424	536.8164	498.3270	394.0627	262.3565	175.5722	183.5148	285.9053	415.5897	447.0816	448.0405 (95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W													
725.4724 701.6785 634.3121 521.0380 396.3346 262.4271 175.5747 183.5204 286.4524 443.0413 592.7307 717.1464 (97)													
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)	
Space heating kWh													
191.4041 125.7555 72.5368 16.3519 1.6902 0.0000 0.0000 0.0000 0.0000 20.4240 104.8673 200.2148 (98)													
Space heating													733.2447 (98)
Space heating per m2													10.1797 (99)
(98) / (4) =													

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8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	733.2447 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	821.9673 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	43.2614 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2046.3037 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2293.9064 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	120.7319 (310b)
Electricity used for heat distribution	32.7987 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	173.0071 (330a)
Total electricity for the above, kWh/year	173.0071 (331)
Electricity for lighting (calculated in Appendix L)	320.9819 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	3773.8560 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1246.3495	0.5190	646.8554 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	165.6499	0.5190	85.9723 (368)
Electrical energy for heat distribution	32.7987	0.5190	17.0225 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			749.8502 (373)
Space and water heating			749.8502 (376)
Pumps and fans	173.0071	0.5190	89.7907 (378)
Energy for lighting	320.9819	0.5190	166.5896 (379)
Energy saving/generation technologies			
PV Unit	-353.1100	0.5190	-183.2641 (380)
Total CO2, kg/year			822.9663 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			11.4300 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		11.4300 ZC1
Total Floor Area	TFA	72.0300
Assumed number of occupants	N	2.2944
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.6172 ZC2
CO2 emissions from cooking, equation (L16)		2.4166 ZC3
Total CO2 emissions		30.4638 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		30.4638 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.0300 (1b)	x 2.5000 (2b)	= 180.0750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 180.0750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1666 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4166 (18)
Number of sides sheltered					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3541 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4515	0.4426	0.4338	0.3895	0.3807	0.3364	0.3364	0.3275	0.3541	0.3807	0.3984	0.4161 (22b)
Effective ac	0.6019	0.5980	0.5941	0.5759	0.5725	0.5566	0.5566	0.5536	0.5627	0.5725	0.5793	0.5866 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			12.3500	1.3258	16.3731			(27)					
External Wall	39.7500	12.3500	27.4000	0.1800	4.9320			(29a)					
Corridor	10.1800	1.8900	8.2900	0.1800	1.4922			(29a)					
Total net area of external elements Aum(A, m2)			49.9300					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.6873			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								5.2448 (36)					
Total fabric heat loss						(33) + (36) =	29.9321	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 35.7690	Feb 35.5338	Mar 35.3033	Apr 34.2205	May 34.0179	Jun 33.0748	Jul 33.0748	Aug 32.9002	Sep 33.4381	Oct 34.0179	Nov 34.4277	Dec 34.8562	(38)
Heat transfer coeff	65.7011	65.4659	65.2354	64.1526	63.9500	63.0069	63.0069	62.8323	63.3702	63.9500	64.3598	64.7883	(39)
Average = Sum(39)m / 12 =												64.1516	(39)
HLP	Jan 0.9121	Feb 0.9089	Mar 0.9057	Apr 0.8906	May 0.8878	Jun 0.8747	Jul 0.8747	Aug 0.8723	Sep 0.8798	Oct 0.8878	Nov 0.8935	Dec 0.8995	(40)
HLP (average)												0.8906	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2944 (42)
Average daily hot water use (litres/day)												88.6916 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	97.5607	94.0131	90.4654	86.9177	83.3701	79.8224	79.8224	83.3701	86.9177	90.4654	94.0131	97.5607 (44)
Energy conte	144.6798	126.5378	130.5757	113.8391	109.2313	94.2583	87.3442	100.2287	101.4258	118.2020	129.0267	140.1146 (45)
Energy content (annual)										Total = Sum(45)m =		1395.4639 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.7020	18.9807	19.5864	17.0759	16.3847	14.1387	13.1016	15.0343	15.2139	17.7303	19.3540	21.0172 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

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If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	191.2747	168.6236	177.1706	158.9309	155.8262	139.3501	133.9391	146.8236	146.5176	164.7969	174.1185	186.7095 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	191.2747	168.6236	177.1706	158.9309	155.8262	139.3501	133.9391	146.8236	146.5176	164.7969	174.1185	186.7095 (64)
	85.3819	75.7424	80.6923	73.9250	73.5953	67.4144	66.3179	70.6020	69.7975	76.5781	78.9748	83.8640 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5438	16.4704	13.3947	10.1406	7.5802	6.3996	6.9149	8.9883	12.0641	15.3181	17.8785	19.0592	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9878	204.0838	198.8019	187.5575	173.3634	160.0230	151.1107	149.0147	154.2966	165.5410	179.7351	193.0756	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	(71)
Water heating gains (Table 5)	114.7607	112.7119	108.4575	102.6736	98.9185	93.6311	89.1369	94.8951	96.9410	102.9275	109.6873	112.7205	(72)
Total internal gains	395.7080	393.6819	381.0698	360.7874	340.2778	320.4693	307.5783	313.3139	323.7174	344.2024	367.7166	385.2710	(73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Southwest			5.8800		36.7938		0.6300		0.7000		0.7700		66.1187 (79)
West			3.9200		19.6403		0.6300		0.7000		0.7700		23.5291 (80)
Northwest			2.5500		11.2829		0.6300		0.7000		0.7700		8.7929 (81)
Solar gains	98.4407	176.5508	262.1463	354.4454	420.5353	426.9027	407.7337	357.6112	294.3091	200.9633	119.5968	83.1138	(83)
Total gains	494.1487	570.2327	643.2161	715.2328	760.8132	747.3720	715.3120	670.9251	618.0265	545.1657	487.3134	468.3847	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.1340	76.4075	76.6775	77.9717	78.2187	79.3894	79.3894	79.6101	78.9343	78.2187	77.7206	77.2066	
alpha	6.0756	6.0938	6.1118	6.1981	6.2146	6.2926	6.2926	6.3073	6.2623	6.2146	6.1814	6.1471	
util living area	0.9957	0.9890	0.9676	0.8937	0.7373	0.5344	0.3870	0.4296	0.6817	0.9312	0.9892	0.9968	(86)
MIT	20.1752	20.3317	20.5585	20.8125	20.9537	20.9947	20.9994	20.9989	20.9781	20.7845	20.4357	20.1508	(87)
Th 2	20.1572	20.1600	20.1627	20.1755	20.1779	20.1890	20.1890	20.1911	20.1847	20.1779	20.1730	20.1680	(88)
util rest of house	0.9943	0.9856	0.9580	0.8659	0.6853	0.4690	0.3160	0.3547	0.6113	0.9062	0.9853	0.9958	(89)
MIT 2	19.0583	19.2872	19.6128	19.9669	20.1362	20.1857	20.1888	20.1907	20.1690	19.9403	19.4494	19.0312	(90)
Living area fraction									fLA = Living area / (4) =			0.3762	(91)
MIT	19.4785	19.6802	19.9686	20.2851	20.4438	20.4901	20.4938	20.4947	20.4734	20.2579	19.8205	19.4524	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4785	19.6802	19.9686	20.2851	20.4438	20.4901	20.4938	20.4947	20.4734	20.2579	19.8205	19.4524	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	490.6249	560.6724	614.4704	622.2038	534.6411	368.8203	245.1432	256.9055	393.6713	495.5482	479.1311	465.8693	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	997.2450	967.5969	878.6310	730.3805	559.1638	371.1163	245.3351	257.2815	403.8865	617.6215	818.6890	988.1775	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	376.9254	273.4533	196.5355	77.8872	18.2449	0.0000	0.0000	0.0000	0.0000	90.8225	244.4817	388.5973	(98)
Space heating												1666.9477	(98)
Space heating per m2												23.1424	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1782.8318 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	376.9254	273.4533	196.5355	77.8872	18.2449	0.0000	0.0000	0.0000	0.0000	90.8225	244.4817	388.5973	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	403.1287	292.4634	210.1984	83.3018	19.5133	0.0000	0.0000	0.0000	0.0000	97.1364	261.4777	415.6120	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	191.2747	168.6236	177.1706	158.9309	155.8262	139.3501	133.9391	146.8236	146.5176	164.7969	174.1185	186.7095	(64)
Efficiency of water heater (217)m	86.5915	86.0966	85.0909	83.0286	80.8013	79.8000	79.8000	79.8000	79.8000	83.2993	85.7192	79.8000	(216)
Fuel for water heating, kWh/month	220.8932	195.8539	208.2134	191.4171	192.8511	174.6242	167.8435	183.9895	183.6060	197.8371	203.1267	215.2866	(219)
Water heating fuel used												2335.5422	(219)
Annual totals kWh/year													
Space heating fuel - main system												1782.8318	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												327.4893	(232)
Total delivered energy for all uses												4520.8633	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1782.8318	0.2160	385.0917 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2335.5422	0.2160	504.4771 (264)
Space and water heating			889.5688 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	327.4893	0.5190	169.9670 (268)
Total CO2, kg/m2/year			1098.4607 (272)
Emissions per m2 for space and water heating			12.3500 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3597 (272b)
Emissions per m2 for pumps and fans			0.5404 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.3500 * 1.55) + 2.3597 + 0.5404, rounded to 2 d.p.			22.0400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010509				Issued on Date	29/04/2022
Assessment Reference	031		Prop Type Ref			
Property						
SAP Rating	83 B	DER	14.84	TER	26.77	
Environmental	90 B	% DER<TER	44.56			
CO ₂ Emissions (t/year)	0.82	DFEE	43.08	TFEE	50.67	
General Requirements Compliance	Fail	% DFEE<TFEE	14.98			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 70 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 26.77 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.84 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)50.7 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)43.1 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing North:	1.37 m ² , No overhang
Windows facing North East:	9.00 m ² , No overhang
Windows facing North West:	6.24 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	353.11 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	69.9600 (1b)	x 2.5000 (2b)	= 174.9000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.9000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			16.6100	1.1450	19.0191		(27)
External Wall	37.2300	16.6100	20.6200	0.1500	3.0930		(29a)
Corridor	5.6000	1.8900	3.7100	0.2500	0.9275		(29a)
Main Roof	69.9600		69.9600	0.1000	6.9960		(30)
Total net area of external elements Aum(A, m ²)			112.7900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		31.9256		(33)
Party Wall			39.7800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.5958 (36)
Total fabric heat loss						(33) + (36) =	42.5214 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	16.1644	15.9804	15.7964	14.8766	14.6926	13.7727	13.7727	13.5887	14.1407	14.6926	15.0605	15.4285 (38)
Heat transfer coeff	58.6858	58.5018	58.3178	57.3979	57.2140	56.2941	56.2941	56.1101	56.6620	57.2140	57.5819	57.9499 (39)
Average = Sum(39)m / 12 =												57.3519 (39)
HLP	0.8388	0.8362	0.8336	0.8204	0.8178	0.8047	0.8047	0.8020	0.8099	0.8178	0.8231	0.8283 (40)
HLP (average)												0.8198 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2452 (42)
Average daily hot water use (litres/day)												87.5224 (43)
Daily hot water use	96.2746	92.7737	89.2728	85.7719	82.2710	78.7702	78.7702	82.2710	85.7719	89.2728	92.7737	96.2746 (44)
Energy conte	142.7725	124.8697	128.8544	112.3384	107.7913	93.0157	86.1928	98.9074	100.0887	116.6437	127.3258	138.2675 (45)
Energy content (annual)										Total = Sum(45)m =		1377.0680 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4159	18.7305	19.3282	16.8508	16.1687	13.9524	12.9289	14.8361	15.0133	17.4966	19.0989	20.7401 (46)

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	198.0493	174.7972	184.1312	165.8321	163.0681	146.5094	141.4696	154.1842	153.5824	171.9205	180.8194	193.5443	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
	Solar input (sum of months) = Sum (63)m =											0.0000 (63)	
Output from w/h													
	198.0493	174.7972	184.1312	165.8321	163.0681	146.5094	141.4696	154.1842	153.5824	171.9205	180.8194	193.5443	(64)
	Total per year (kWh/year) = Sum (64)m =											2027.9078 (64)	
Heat gains from water heating, kWh/month													
	91.6933	81.4611	87.0655	80.1475	80.0621	73.7227	72.8805	77.1082	76.0744	83.0055	85.1308	90.1954	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.5809	15.6152	12.6991	9.6140	7.1866	6.0672	6.5559	8.5216	11.4376	14.5227	16.9501	18.0695 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.2037	199.2500	194.0933	183.1152	169.2573	156.2328	147.5316	145.4853	150.6420	161.6202	175.4781	188.5025 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061 (71)
Water heating gains (Table 5)	123.2437	121.2219	117.0236	111.3159	107.6103	102.3926	97.9577	103.6400	105.6589	111.5665	118.2372	121.2304 (72)
Total internal gains	394.7055	392.7644	380.4932	360.7224	340.7315	321.3699	308.7225	314.3242	324.4159	344.3867	367.3426	384.4797 (73)

[Jan	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	1.3700	10.6334	0.4000	0.8000	0.7700	3.2305 (74)
Northeast	9.0000	11.2829	0.4000	0.8000	0.7700	22.5189 (75)
Northwest	6.2400	11.2829	0.4000	0.8000	0.7700	15.6131 (81)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	82.7856	83.0459	83.3079	84.6430	84.9152	86.3027	86.3027	86.5857	85.7423	84.9152	84.3726	83.8368
alpha	6.5190	6.5364	6.5539	6.6429	6.6610	6.7535	6.7535	6.7724	6.7162	6.6610	6.6248	6.5891
util living area	0.9972	0.9942	0.9819	0.9197	0.7499	0.5303	0.3871	0.4457	0.7351	0.9585	0.9934	0.9978 (86)
MIT	20.2241	20.3336	20.5379	20.8058	20.9599	20.9965	20.9996	20.9991	20.9743	20.7614	20.4521	20.2069 (87)
Th 2	20.2198	20.2221	20.2243	20.2357	20.2379	20.2493	20.2493	20.2516	20.2447	20.2379	20.2334	20.2288 (88)
util rest of house	0.9963	0.9924	0.9761	0.8971	0.7008	0.4697	0.3212	0.3737	0.6680	0.9418	0.9909	0.9971 (89)
MIT 2	19.1780	19.3390	19.6355	20.0142	20.2014	20.2471	20.2492	20.2512	20.2254	19.9641	19.5210	19.1600 (90)
Living area fraction									fLA = Living area / (4) =			0.3616 (91)
MIT	19.5563	19.6987	19.9618	20.3005	20.4757	20.5181	20.5206	20.5217	20.4962	20.2524	19.8577	19.5386 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5563	19.6987	19.9618	20.3005	20.4757	20.5181	20.5206	20.5217	20.4962	20.2524	19.8577	19.5386 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9953	0.9908	0.9737	0.8993	0.7167	0.4916	0.3451	0.3998	0.6912	0.9421	0.9894	0.9963 (94)
Useful gains	434.0035	472.1819	516.8759	546.0734	481.7111	331.7132	220.5945	230.9866	350.7501	420.7462	414.8620	416.7652 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	895.3286	865.7498	785.0629	654.3634	502.0936	333.1545	220.7044	231.2681	362.4242	552.2542	734.6141	888.8709 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	343.2259	264.4777	199.5311	77.9688	15.1646	0.0000	0.0000	0.0000	0.0000	97.8420	230.2215	351.2467 (98)
Space heating												1579.6782 (98)
Space heating per m2												22.5797 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1579.6782 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1770.8192 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	93.2010 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2027.9078 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2273.2846 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	119.6466 (310b)
Electricity used for heat distribution	42.5695 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	168.0352 (330a)
Total electricity for the above, kWh/year	168.0352 (331)
Electricity for lighting (calculated in Appendix L)	310.4834 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	4735.4700 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1617.6415	0.5190	839.5560 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	214.9975	0.5190	111.5837 (368)
Electrical energy for heat distribution	42.5695	0.5190	22.0936 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			973.2333 (373)
Space and water heating			973.2333 (376)
Pumps and fans	168.0352	0.5190	87.2103 (378)
Energy for lighting	310.4834	0.5190	161.1409 (379)
Energy saving/generation technologies			
PV Unit	-353.1100	0.5190	-183.2641 (380)
Total CO2, kg/year			1038.3203 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.8400 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			14.8400 ZC1
Total Floor Area		TFA	69.9600
Assumed number of occupants		N	2.2452
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.7037 ZC2
CO2 emissions from cooking, equation (L16)			2.4712 ZC3
Total CO2 emissions			34.0148 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			34.0148 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	69.9600 (1b)	x 2.5000 (2b)	= 174.9000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 174.9000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) = 0.1144 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3644 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3097 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.3949	0.3871	0.3794	0.3407	0.3329	0.2942	0.2942	0.2865	0.3097	0.3329	0.3484	0.3639 (22b)
Effective ac	0.5780	0.5749	0.5720	0.5580	0.5554	0.5433	0.5433	0.5410	0.5480	0.5554	0.5607	0.5662 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			15.6100	1.3258	20.6951		(27)
External Wall	37.2300	15.6100	21.6200	0.1800	3.8916		(29a)
Corridor	5.6000	1.8900	3.7100	0.1800	0.6678		(29a)
Main Roof	69.9600		69.9600	0.1300	9.0948		(30)
Total net area of external elements Aum(A, m ²)			112.7900				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	36.2393	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.3837 (36)
Total fabric heat loss						(33) + (36) =	43.6230 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	33.3581	33.1834	33.0121	32.2077	32.0572	31.3565	31.3565	31.2268	31.6264	32.0572	32.3616	32.6799 (38)
Heat transfer coeff	76.9811	76.8063	76.6351	75.8306	75.6801	74.9795	74.9795	74.8498	75.2494	75.6801	75.9846	76.3029 (39)
Average = Sum(39)m / 12 =												75.8299 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1004	1.0979	1.0954	1.0839	1.0818	1.0717	1.0717	1.0699	1.0756	1.0818	1.0861	1.0907 (40)
HLP (average)												1.0839 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2452 (42)
Average daily hot water use (litres/day)												87.5224 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	96.2746	92.7737	89.2728	85.7719	82.2710	78.7702	78.7702	82.2710	85.7719	89.2728	92.7737	96.2746 (44)
Energy content (annual)	142.7725	124.8697	128.8544	112.3384	107.7913	93.0157	86.1928	98.9074	100.0887	116.6437	127.3258	138.2675 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.4159	18.7305	19.3282	16.8508	16.1687	13.9524	12.9289	14.8361	15.0133	17.4966	19.0989	20.7401 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	189.3674	166.9555	175.4493	157.4302	154.3862	138.1076	132.7877	145.5023	145.1806	163.2386	172.4176	184.8624 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	189.3674	166.9555	175.4493	157.4302	154.3862	138.1076	132.7877	145.5023	145.1806	163.2386	172.4176	184.8624 (64)
Heat gains from water heating, kWh/month	84.7478	75.1878	80.1200	73.4260	73.1165	67.0012	65.9350	70.1626	69.3530	76.0600	78.4093	83.2499 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	112.2577	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.5806	15.6149	12.6989	9.6139	7.1865	6.0671	6.5558	8.5214	11.4374	14.5225	16.9499	18.0692	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.2037	199.2500	194.0933	183.1152	169.2573	156.2328	147.5316	145.4853	150.6420	161.6202	175.4781	188.5025	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	34.2258	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	-89.8061	(71)
Water heating gains (Table 5)	113.9083	111.8866	107.6882	101.9805	98.2749	93.0572	88.6223	94.3046	96.3236	102.2311	108.9018	111.8950	(72)
Total internal gains	388.3699	386.4288	374.1577	354.3869	334.3960	315.0345	302.3870	307.9886	318.0804	338.0511	361.0070	378.1440	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W

North					1.2900	10.6334		0.6300	0.7000	0.7700		4.1921 (74)
Northeast					8.4600	11.2829		0.6300	0.7000	0.7700		29.1719 (75)
Northwest					5.8600	11.2829		0.6300	0.7000	0.7700		20.2065 (81)

Solar gains	53.5705	108.5225	194.7025	319.2669	429.2206	457.7249	428.1339	341.2003	237.0276	132.3691	67.3023	43.8197 (83)
Total gains	441.9404	494.9514	568.8601	673.6538	763.6166	772.7594	730.5209	649.1889	555.1079	470.4202	428.3094	421.9637 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	63.1108	63.2543	63.3957	64.0682	64.1956	64.7955	64.7955	64.9078	64.5631	64.1956	63.9384	63.6717	
alpha	5.2074	5.2170	5.2264	5.2712	5.2797	5.3197	5.3197	5.3272	5.3042	5.2797	5.2626	5.2448	
util living area	0.9975	0.9949	0.9850	0.9391	0.8046	0.6014	0.4480	0.5217	0.8120	0.9723	0.9948	0.9980	(86)
MIT	19.8556	19.9915	20.2531	20.6128	20.8785	20.9793	20.9964	20.9923	20.9068	20.5519	20.1442	19.8319	(87)
Th 2	20.0005	20.0026	20.0046	20.0140	20.0158	20.0240	20.0240	20.0255	20.0208	20.0158	20.0122	20.0085	(88)
util rest of house	0.9966	0.9932	0.9798	0.9183	0.7499	0.5179	0.3506	0.4157	0.7368	0.9590	0.9928	0.9974	(89)
MIT 2	18.4764	18.6758	19.0562	19.5679	19.9029	20.0111	20.0227	20.0225	19.9480	19.4953	18.9063	18.4474	(90)
Living area fraction	0.9966	0.9932	0.9798	0.9183	0.7499	0.5179	0.3506	0.4157	0.7368	0.9590	0.9928	0.9974	(91)
MIT	18.9751	19.1516	19.4890	19.9458	20.2557	20.3613	20.3748	20.3732	20.2947	19.8774	19.3540	18.9481	(92)
Temperature adjustment	18.9751	19.1516	19.4890	19.9458	20.2557	20.3613	20.3748	20.3732	20.2947	19.8774	19.3540	18.9481	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	439.9053	490.6056	555.3546	617.5049	583.6061	423.1178	281.9133	294.8570	421.8339	450.0326	424.3942	420.4226	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1129.7083	1094.6144	995.4139	837.6101	647.4953	431.9764	283.0339	297.3936	466.1498	702.1129	931.1127	1125.3208	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	513.2134	405.8939	327.4041	158.4757	47.5336	0.0000	0.0000	0.0000	0.0000	187.5477	364.8374	524.4443	(98)
Space heating												2529.3502	(98)
Space heating per m2												36.1542	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2705.1873 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	513.2134	405.8939	327.4041	158.4757	47.5336	0.0000	0.0000	0.0000	0.0000	187.5477	364.8374	524.4443	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	548.8914	434.1111	350.1649	169.4928	50.8380	0.0000	0.0000	0.0000	0.0000	200.5858	390.2004	560.9030	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	189.3674	166.9555	175.4493	157.4302	154.3862	138.1076	132.7877	145.5023	145.1806	163.2386	172.4176	184.8624	(64)
Efficiency of water heater (217)m	87.3434	87.0964	86.4553	84.8315	82.0846	79.8000	79.8000	79.8000	79.8000	85.1848	86.7664	87.4442	(216)
Fuel for water heating, kWh/month	216.8079	191.6905	202.9363	185.5799	188.0818	173.0671	166.4006	182.3338	181.9305	191.6289	198.7148	211.4062	(219)
Water heating fuel used												2290.5784	(219)
Annual totals kWh/year													
Space heating fuel - main system												2705.1873	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												310.4787	(232)
Total delivered energy for all uses												5381.2444	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2705.1873	0.2160	584.3205 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2290.5784	0.2160	494.7649 (264)
Space and water heating			1079.0854 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	310.4787	0.5190	161.1384 (268)
Total CO2, kg/m2/year			1279.1488 (272)
Emissions per m2 for space and water heating			15.4243 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3033 (272b)
Emissions per m2 for pumps and fans			0.5564 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.4243 * 1.55) + 2.3033 + 0.5564, rounded to 2 d.p.			26.7700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010510				Issued on Date	29/04/2022
Assessment Reference	032		Prop Type Ref			
Property						
SAP Rating	83 B	DER	14.52	TER	26.21	
Environmental	90 B	% DER<TER	44.60			
CO ₂ Emissions (t/year)	0.85	DFEE	43.14	TFEE	49.48	
General Requirements Compliance	Pass	% DFEE<TFEE	12.82			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 75 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 26.21 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.52 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)49.5 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)43.1 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing North East:	9.93 m ² , No overhang
Windows facing East:	2.21 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	353.11 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	74.6300 (1b)	x 2.5000 (2b)	= 186.5750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 186.5750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			12.1400	1.1450	13.9008		(27)
External Wall	31.9300	12.1400	19.7900	0.1500	2.9685		(29a)
Corridor	25.0000	1.8900	23.1100	0.2500	5.7775		(29a)
Main Roof	74.6300		74.6300	0.1000	7.4630		(30)
Total net area of external elements Aum(A, m ²)					131.5600		(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	31.9998	(33)
Party Wall			41.5000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.9526 (36)
Total fabric heat loss							(33) + (36) = 42.9524 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	16.3602	16.1813	16.0024	15.1077	14.9287	14.0341	14.0341	13.8551	14.3919	14.9287	15.2866	15.6445 (38)
Average = Sum(39)m / 12 =	59.3126	59.1337	58.9547	58.0600	57.8811	56.9864	56.9864	56.8075	57.3443	57.8811	58.2390	58.5969 (39)
	59.3126	59.1337	58.9547	58.0600	57.8811	56.9864	56.9864	56.8075	57.3443	57.8811	58.2390	58.0153 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7948	0.7924	0.7900	0.7780	0.7756	0.7636	0.7636	0.7612	0.7684	0.7756	0.7804	0.7852 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3531 (42)
Average daily hot water use (litres/day)												90.0860 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	99.0946	95.4911	91.8877	88.2843	84.6808	81.0774	81.0774	84.6808	88.2843	91.8877	95.4911	99.0946 (44)
Energy content (annual)	146.9544	128.5272	132.6286	115.6288	110.9486	95.7402	88.7174	101.8045	103.0204	120.0603	131.0552	142.3175 (45)
Distribution loss (46)m = 0.15 x (45)m	22.0432	19.2791	19.8943	17.3443	16.6423	14.3610	13.3076	15.2707	15.4531	18.0090	19.6583	21.3476 (46)
Total = Sum(45)m												1417.4032 (45)

Water storage loss:												
Store volume												
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												
Volume factor from Table 2a												
Temperature factor from Table 2b												
Enter (49) or (54) in (55)												
Total storage loss												
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 (56)												
If cylinder contains dedicated solar storage												
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 (57)												
Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120 23.2624 (59)												
Total heat required for water heating calculated for each month												
202.2312 178.4547 187.9054 169.1225 166.2254 149.2339 143.9942 157.0813 156.5141 175.3371 184.5489 197.5943 (62)												
Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63)												
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Output from w/h												
202.2312 178.4547 187.9054 169.1225 166.2254 149.2339 143.9942 157.0813 156.5141 175.3371 184.5489 197.5943 (64)												
Total per year (kWh/year) = Sum(64)m = 2068.2430 (64)												
Heat gains from water heating, kWh/month												
93.0838 82.6773 88.3205 81.2415 81.1119 74.6286 73.7200 78.0714 77.0492 84.1415 86.3708 91.5420 (65)												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9961	0.9929	0.9810	0.9295	0.7825	0.5560	0.3909	0.4418	0.7310	0.9526	0.9912	0.9970 (94)
Useful gains	442.8399	474.0744	507.4885	529.1497	477.3237	336.0058	224.5905	235.0705	353.4054	420.5023	420.9134	426.2809 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	909.1701	878.2058	794.7850	661.3486	508.3751	338.5139	224.7715	235.4795	367.9482	560.0735	746.0809	903.1140 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	346.9497	271.5763	213.7486	95.1832	23.1023	0.0000	0.0000	0.0000	0.0000	103.8410	234.1206	354.7639 (98)
Space heating												1643.2857 (99)
Space heating per m2										(98) / (4) =		22.0191 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1643.2857 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1842.1232 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	96.9539 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2068.2430 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2318.5004 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	122.0263 (310b)
Electricity used for heat distribution	43.7960 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	179.2519 (330a)
Total electricity for the above, kWh/year	179.2519 (331)
Electricity for lighting (calculated in Appendix L)	332.5970 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	4891.4527 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1664.2494	0.5190	863.7455 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	221.1921	0.5190	114.7987 (368)
Electrical energy for heat distribution	43.7960	0.5190	22.7301 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1001.2743 (373)
Space and water heating			1001.2743 (376)
Pumps and fans	179.2519	0.5190	93.0318 (378)
Energy for lighting	332.5970	0.5190	172.6178 (379)
Energy saving/generation technologies			
PV Unit	-353.1100	0.5190	-183.2641 (380)
Total CO2, kg/year			1083.6598 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.5200 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER	14.5200 ZC1
Total Floor Area	74.6300 TFA
Assumed number of occupants	2.3531 N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190 EF
CO2 emissions from appliances, equation (L14)	16.5040 ZC2
CO2 emissions from cooking, equation (L16)	2.3513 ZC3
Total CO2 emissions	33.3753 ZC4
Residual CO2 emissions offset from biofuel CHP	0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year	0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000 ZC7
Net CO2 emissions	33.3753 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	74.6300 (1b)	x 2.5000 (2b)	= 186.5750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	74.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 186.5750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1608 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4108 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3184 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4059	0.3980	0.3900	0.3502	0.3422	0.3024	0.3024	0.2945	0.3184	0.3422	0.3582	0.3741 (22b)
Effective ac	0.5824	0.5792	0.5760	0.5613	0.5586	0.5457	0.5457	0.5434	0.5507	0.5586	0.5641	0.5700 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			12.1400	1.3258	16.0947		(27)
External Wall	31.9300	12.1400	19.7900	0.1800	3.5622		(29a)
Corridor	25.0000	1.8900	23.1100	0.1800	4.1598		(29a)
Main Roof	74.6300		74.6300	0.1300	9.7019		(30)
Total net area of external elements Aum(A, m ²)			131.5600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	35.4086	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.6755 (36)
Total fabric heat loss						(33) + (36) =	43.0841 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	35.8572	35.6602	35.4672	34.5604	34.3907	33.6009	33.6009	33.4546	33.9051	34.3907	34.7339	35.0928 (38)
Heat transfer coeff	78.9413	78.7443	78.5513	77.6445	77.4748	76.6850	76.6850	76.5387	76.9892	77.4748	77.8180	78.1768 (39)
Average = Sum(39)m / 12 =												77.6436 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0578	1.0551	1.0525	1.0404	1.0381	1.0275	1.0275	1.0256	1.0316	1.0381	1.0427	1.0475 (40)
HLP (average)												1.0404 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3531 (42)
Average daily hot water use (litres/day)												90.0860 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	99.0946	95.4911	91.8877	88.2843	84.6808	81.0774	81.0774	84.6808	88.2843	91.8877	95.4911	99.0946 (44)
Energy conte	146.9544	128.5272	132.6286	115.6288	110.9486	95.7402	88.7174	101.8045	103.0204	120.0603	131.0552	142.3175 (45)
Energy content (annual)										Total = Sum(45)m =		1417.4032 (45)
Distribution loss (46)m = 0.15 x (45)m	22.0432	19.2791	19.8943	17.3443	16.6423	14.3610	13.3076	15.2707	15.4531	18.0090	19.6583	21.3476 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	193.5493	170.6130	179.2235	160.7207	157.5435	140.8321	135.3123	148.3994	148.1122	166.6552	176.1471	188.9124 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	193.5493	170.6130	179.2235	160.7207	157.5435	140.8321	135.3123	148.3994	148.1122	166.6552	176.1471	188.9124 (64)
Heat gains from water heating, kWh/month	86.1383	76.4039	81.3749	74.5201	74.1663	67.9071	66.7745	71.1259	70.3277	77.1960	79.6493	84.5965 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547	117.6547 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.2699	17.1154	13.9192	10.5377	7.8770	6.6501	7.1857	9.3403	12.5365	15.9179	18.5786	19.8055 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	207.8536	210.0105	204.5753	193.0043	178.3980	164.6701	155.4991	153.3422	158.7774	170.3484	184.9547	198.6826 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655	34.7655 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238	-94.1238 (71)
Water heating gains (Table 5)	115.7772	113.6963	109.3749	103.5001	99.6859	94.3154	89.7506	95.5994	97.6774	103.7580	110.6241	113.7050 (72)
Total internal gains	404.1972	402.1185	389.1657	368.3384	347.2574	326.9321	313.7318	319.5782	330.2877	351.3208	375.4538	393.4894 (73)

6. Solar gains

[Jan]			Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W				
Northeast			9.9300	11.2829	0.6300	0.7000	0.7700	34.2408 (75)				
East			2.2100	19.6403	0.6300	0.7000	0.7700	13.2651 (76)				
Solar gains	47.5059	95.6475	168.3087	268.5545	353.5944	373.7283	350.9101	284.3482	202.7161	115.9677	59.6238	38.8713 (83)
Total gains	451.7031	497.7660	557.4744	636.8930	700.8518	700.6604	664.6419	603.9264	533.0038	467.2885	435.0776	432.3607 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	65.6518	65.8160	65.9778	66.7483	66.8945	67.5835	67.5835	67.7126	67.3164	66.8945	66.5995	66.2938
alpha	5.3768	5.3877	5.3985	5.4499	5.4596	5.5056	5.5056	5.5142	5.4878	5.4596	5.4400	5.4196
util living area	0.9979	0.9960	0.9891	0.9579	0.8566	0.6677	0.5016	0.5702	0.8444	0.9779	0.9958	0.9984 (86)
MIT	19.8896	20.0114	20.2472	20.5770	20.8457	20.9704	20.9948	20.9901	20.8957	20.5520	20.1677	19.8693 (87)
Th 2	20.0355	20.0376	20.0398	20.0498	20.0517	20.0605	20.0605	20.0621	20.0571	20.0517	20.0479	20.0439 (88)
util rest of house	0.9972	0.9947	0.9852	0.9424	0.8095	0.5830	0.3977	0.4605	0.7760	0.9670	0.9941	0.9978 (89)
MIT 2	18.5513	18.7306	19.0746	19.5505	19.9018	20.0411	20.0585	20.0579	19.9722	19.5242	18.9668	18.5278 (90)
Living area fraction									fLA = Living area / (4) =			0.3631 (91)
MIT	19.0373	19.1957	19.5004	19.9232	20.2445	20.3786	20.3985	20.3964	20.3075	19.8974	19.4029	19.0150 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0373	19.1957	19.5004	19.9232	20.2445	20.3786	20.3985	20.3964	20.3075	19.8974	19.4029	19.0150 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9962	0.9931	0.9823	0.9400	0.8201	0.6128	0.4356	0.5005	0.7962	0.9648	0.9925	0.9970 (94)
Useful gains	449.9918	494.3266	547.6274	598.6574	574.7676	429.3573	289.5377	302.2912	424.4038	450.8242	431.8055	431.0592 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1163.3779	1125.7070	1021.2002	855.8935	661.9856	443.1293	291.2894	305.8803	477.9138	720.3123	957.3871	1158.1867 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	530.7592	424.2876	352.3382	185.2100	64.8902	0.0000	0.0000	0.0000	0.0000	200.4992	378.4187	540.9828 (98)
Space heating												2677.3860 (98)
Space heating per m2										(98) / (4) =		35.8755 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2863.5144 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	530.7592	424.2876	352.3382	185.2100	64.8902	0.0000	0.0000	0.0000	0.0000	200.4992	378.4187	540.9828	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	567.6569	453.7835	376.8323	198.0856	69.4013	0.0000	0.0000	0.0000	0.0000	214.4376	404.7259	578.5913	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	193.5493	170.6130	179.2235	160.7207	157.5435	140.8321	135.3123	148.3994	148.1122	166.6552	176.1471	188.9124	(64)
Efficiency of water heater (217)m	87.3695	87.1487	86.5856	85.1928	82.6508	79.8000	79.8000	79.8000	79.8000	85.3079	86.8031	79.8000	(216)
Fuel for water heating, kWh/month	221.5295	195.7722	206.9900	188.6553	190.6135	176.4813	169.5643	185.9642	185.6043	195.3572	202.9272	215.9872	(219)
Water heating fuel used												2335.4461	(219)
Annual totals kWh/year												2863.5144	(211)
Space heating fuel - main system												0.0000	(215)
Space heating fuel - secondary													
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												340.3127	(232)
Total delivered energy for all uses												5614.2732	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2863.5144	0.2160	618.5191 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2335.4461	0.2160	504.4564 (264)
Space and water heating			1122.9755 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	340.3127	0.5190	176.6223 (268)
Total CO2, kg/m2/year			1338.5228 (272)
Emissions per m2 for space and water heating			15.0472 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3666 (272b)
Emissions per m2 for pumps and fans			0.5216 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.0472 * 1.55) + 2.3666 + 0.5216, rounded to 2 d.p.			26.2100 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010511	Issued on Date	29/04/2022
Assessment Reference	036	Prop Type Ref	
Property			
SAP Rating	83 B	DER	13.89
Environmental	90 B	TER	24.71
CO ₂ Emissions (t/year)	0.81	% DER<TER	43.79
General Requirements Compliance	Pass	DFEE	40.19
		TFEE	44.03
		% DFEE<TFEE	8.72
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 24.71 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.89 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)44.0 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)40.2 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.23 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing South West:	12.12 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	353.11 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.1200 (1b)	x 2.5000 (2b)	= 182.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 182.8000 (5)

2. Ventilation rate

					main	secondary	other			total	m3 per hour	
					heating		heating					
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Air changes per hour												
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =										0.0000 / (5) =	0.0000 (8)	
Pressure test												Yes
Measured/design AP50												3.0000
Infiltration rate												0.1500 (18)
Number of sides sheltered												3 (19)
Shelter factor										(20) = 1 - [0.075 x (19)] =	0.7750 (20)	
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =	0.1163 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			12.1200	1.1450	13.8779		(27)					
External Wall	25.1000	12.1200	12.9800	0.1500	1.9470		(29a)					
Corridor	25.1000	1.8900	23.2100	0.2500	5.8025		(29a)					
Core	18.2300		18.2300	0.2500	4.5575		(29a)					
Main Roof	73.1200		73.1200	0.1000	7.3120		(30)					
Total net area of external elements Aum(A, m2)			141.5500				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		35.3869		(33)					
Party Wall			18.2300	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.3272 (36)					
Total fabric heat loss						(33) + (36) =	44.7141 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	16.0292	15.8539	15.6786	14.8020	14.6267	13.7501	13.7501	13.5748	14.1007	14.6267	14.9773	15.3280 (38)
Heat transfer coeff	60.7433	60.5680	60.3926	59.5161	59.3407	58.4642	58.4642	58.2888	58.8148	59.3407	59.6914	60.0420 (39)
Average = Sum(39)m / 12 =												59.4722 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8307	0.8283	0.8259	0.8140	0.8116	0.7996	0.7996	0.7972	0.8044	0.8116	0.8163	0.8211 (40)
HLP (average)												0.8134 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3194 (42)
Average daily hot water use (litres/day)												89.2864 (43)
Daily hot water use	Jan 98.2150	Feb 94.6436	Mar 91.0721	Apr 87.5007	May 83.9292	Jun 80.3578	Jul 80.3578	Aug 83.9292	Sep 87.5007	Oct 91.0721	Nov 94.6436	Dec 98.2150 (44)
Energy conte	145.6501	127.3865	131.4514	114.6025	109.9639	94.8905	87.9300	100.9009	102.1060	118.9947	129.8920	141.0543 (45)
Energy content (annual)												Total = Sum(45)m = 1404.8227 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	21.8475	19.1080	19.7177	17.1904	16.4946	14.2336	13.1895	15.1351	15.3159	17.8492	19.4838	21.1581 (46)
Water storage loss:												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage												
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
	200.9269	177.3139	186.7282	168.0962	165.2407	148.3841	143.2068	156.1777	155.5997	174.2715	183.3857	196.3311 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
	200.9269	177.3139	186.7282	168.0962	165.2407	148.3841	143.2068	156.1777	155.5997	174.2715	183.3857	196.3311 (64)
Total per year (kWh/year) = Sum(64)m =												2055.6625 (64)
Heat gains from water heating, kWh/month												
	92.6501	82.2979	87.9290	80.9003	80.7844	74.3460	73.4582	77.7710	76.7452	83.7872	85.9840	91.1220 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	18.4773	16.4114	13.3466	10.1042	7.5530	6.3766	6.8901	8.9561	12.0208	15.2632	17.8144	18.9908 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	204.4667	206.5884	201.2418	189.8593	175.4910	161.9869	152.9652	150.8435	156.1902	167.5726	181.9409	195.4451 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771 (71)
Water heating gains (Table 5)												
	124.5297	122.4672	118.1842	112.3615	108.5812	103.2584	98.7341	104.5309	106.5905	112.6172	119.4223	122.4758 (72)
Total internal gains												
	405.2651	403.2584	390.5640	370.1165	349.4167	329.4132	316.3809	322.1219	332.5929	353.2444	376.9690	394.7031 (73)

6. Solar gains

[Jan]												
	Area											
	m2											
	Solar flux											
	Table 6a											
	W/m2											
	Specific data											
	or Table 6b											
	Specific data											
	or Table 6c											
	Access											
	factor											
	Table 6d											
	Gains											
	W											
Southwest	12.1200											
	36.7938											
	0.4000											
	0.8000											
	0.7700											
Solar gains	98.8919	168.4495	230.4800	285.5759	319.8688	317.5557	306.1576	280.5735	249.5611	186.1726	118.4497	84.6309 (83)
Total gains	504.1570	571.7079	621.0440	655.6924	669.2855	646.9689	622.5384	602.6954	582.1541	539.4170	495.4187	479.3340 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nil,m (see Table 9a)												21.0000 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	83.5941	83.8360	84.0794	85.3178	85.5698	86.8528	86.8528	87.1141	86.3350	85.5698	85.0672	84.5704
alpha	6.5729	6.5891	6.6053	6.6879	6.7047	6.7902	6.7902	6.8076	6.7557	6.7047	6.6711	6.6380
util living area												
	0.9949	0.9875	0.9676	0.9069	0.7733	0.5723	0.4126	0.4439	0.6775	0.9209	0.9868	0.9962 (86)
MIT	20.3006	20.4398	20.6249	20.8283	20.9530	20.9947	20.9995	20.9992	20.9843	20.8352	20.5339	20.2743 (87)
Th 2	20.2268	20.2288	20.2309	20.2413	20.2433	20.2537	20.2537	20.2558	20.2496	20.2433	20.2392	20.2350 (88)
util rest of house												
	0.9934	0.9839	0.9582	0.8822	0.7251	0.5083	0.3430	0.3726	0.6116	0.8944	0.9823	0.9951 (89)
MIT 2	19.2947	19.4975	19.7627	20.0478	20.1999	20.2503	20.2535	20.2554	20.2382	20.0634	19.6430	19.2629 (90)
Living area fraction												
MIT	19.6717	19.8506	20.0858	20.3403	20.4821	20.5292	20.5330	20.5341	20.5178	20.3526	19.9769	19.6419 (91)
Temperature adjustment												0.0000
adjusted MIT	19.6717	19.8506	20.0858	20.3403	20.4821	20.5292	20.5330	20.5341	20.5178	20.3526	19.9769	19.6419 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9919	0.9816	0.9561	0.8857	0.7410	0.5322	0.3691	0.3994	0.6357	0.8987	0.9803	0.9939 (94)
Useful gains	500.0813	561.2074	593.7780	580.7617	495.9154	344.3041	229.7747	240.6923	370.0986	484.7717	485.6811	476.4132 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
	933.7260	905.5303	820.4834	680.8806	521.1387	346.6476	229.9424	240.9743	377.4625	578.7254	768.6376	927.1630 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
	322.6317	231.3850	168.6688	72.0856	18.7661	0.0000	0.0000	0.0000	0.0000	69.9015	203.7287	335.3579 (98)
Space heating												1422.5252 (98)
Space heating per m2												19.4547 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1422.5252 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1594.6508 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	83.9290 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2055.6625 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2304.3976 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	121.2841 (310b)
Electricity used for heat distribution	41.0426 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	175.6251 (330a)
Total electricity for the above, kWh/year	175.6251 (331)
Electricity for lighting (calculated in Appendix L)	326.3147 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	4606.2013 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1559.6194	0.5190	809.4424 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	207.2859	0.5190	107.5814 (368)
Electrical energy for heat distribution	41.0426	0.5190	21.3011 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			938.3250 (373)
Space and water heating			938.3250 (376)
Pumps and fans	175.6251	0.5190	91.1494 (378)
Energy for lighting	326.3147	0.5190	169.3573 (379)
Energy saving/generation technologies			
PV Unit	-353.1100	0.5190	-183.2641 (380)
Total CO2, kg/year			1015.5676 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			13.8900 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		13.8900 ZC1
Total Floor Area	TFA	73.1200
Assumed number of occupants	N	2.3194
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.5704 ZC2
CO2 emissions from cooking, equation (L16)		2.3888 ZC3
Total CO2 emissions		32.8491 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		32.8491 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.1200 (1b)	x 2.5000 (2b)	= 182.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 182.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1641 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4141 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3209 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4092	0.4012	0.3931	0.3530	0.3450	0.3049	0.3049	0.2969	0.3209	0.3450	0.3611	0.3771 (22b)
Effective ac	0.5837	0.5805	0.5773	0.5623	0.5595	0.5465	0.5465	0.5441	0.5515	0.5595	0.5652	0.5711 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900			(26)				
TER Opening Type (Uw = 1.40)			12.1200	1.3258	16.0682			(27)				
External Wall	25.1000	12.1200	12.9800	0.1800	2.3364			(29a)				
Corridor	25.1000	1.8900	23.2100	0.1800	4.1778			(29a)				
Core	18.2300		18.2300	0.1800	3.2814			(29a)				
Main Roof	73.1200		73.1200	0.1300	9.5056			(30)				
Total net area of external elements Aum(A, m2)			141.5500					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	37.2594			(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								7.1803 (36)				
Total fabric heat loss						(33) + (36) =		44.4397 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 35.2124	Feb 35.0163	Mar 34.8240	Apr 33.9211	May 33.7522	Jun 32.9658	Jul 32.9658	Aug 32.8202	Sep 33.2687	Oct 33.7522	Nov 34.0939	Dec 34.4512 (38)
Heat transfer coeff	79.6521	79.4559	79.2637	78.3608	78.1919	77.4055	77.4055	77.2599	77.7084	78.1919	78.5336	78.8909 (39)
Average = Sum(39)m / 12 =												78.3600 (39)
HLP	Jan 1.0893	Feb 1.0867	Mar 1.0840	Apr 1.0717	May 1.0694	Jun 1.0586	Jul 1.0586	Aug 1.0566	Sep 1.0628	Oct 1.0694	Nov 1.0740	Dec 1.0789 (40)
HLP (average)												1.0717 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3194 (42)
Average daily hot water use (litres/day)												89.2864 (43)
Daily hot water use	98.2150	94.6436	91.0721	87.5007	83.9292	80.3578	80.3578	83.9292	87.5007	91.0721	94.6436	98.2150 (44)
Energy conte	145.6501	127.3865	131.4514	114.6025	109.9639	94.8905	87.9300	100.9009	102.1060	118.9947	129.8920	141.0543 (45)
Energy content (annual)										Total = Sum(45)m =		1404.8227 (45)
Distribution loss (46)m = 0.15 x (45)m												
21.8475	19.1080	19.7177	17.1904	16.4946	14.2336	13.1895	15.1351	15.3159	17.8492	19.4838	21.1581	(46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	192.2450	169.4722	178.0463	159.6944	156.5588	139.9823	134.5249	147.4958	147.1978	165.5896	174.9838	187.6492 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	192.2450	169.4722	178.0463	159.6944	156.5588	139.9823	134.5249	147.4958	147.1978	165.5896	174.9838	187.6492 (64)
Heat gains from water heating, kWh/month	85.7046	76.0246	80.9835	74.1788	73.8389	67.6245	66.5126	70.8255	70.0237	76.8417	79.2626	84.1765 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	115.9714	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.8881	16.7762	13.6433	10.3289	7.7210	6.5184	7.0433	9.1552	12.2880	15.6025	18.2104	19.4130	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.4667	206.5884	201.2418	189.8593	175.4910	161.9869	152.9652	150.8435	156.1902	167.5726	181.9409	195.4451	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	34.5971	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	-92.7771	(71)
Water heating gains (Table 5)	115.1943	113.1318	108.8488	103.0261	99.2458	93.9230	89.3987	95.1955	97.2552	103.2818	110.0869	113.1404	(72)
Total internal gains	399.3405	397.2879	384.5253	364.0057	343.2492	323.2196	310.1987	315.9856	326.5248	347.2483	371.0297	388.7900	(73)

6. Solar gains

[Jan]					Area	Solar flux		g	FF			Access	Gains	
					m2	Table 6a		Specific data	Specific data			factor	W	
						W/m2		or Table 6b	or Table 6c			Table 6d		
-----					-----	-----		-----	-----			-----		
Southwest					12.1200	36.7938		0.6300	0.7000			0.7700	136.2854 (79)	
-----					-----	-----		-----	-----			-----		
Solar gains	136.2854	232.1445	317.6303	393.5593	440.8192	437.6314	421.9234	386.6654	343.9264	256.5692	163.2386	116.6319	(83)	
Total gains	535.6259	629.4324	702.1556	757.5650	784.0685	760.8511	732.1221	702.6510	670.4512	603.8175	534.2682	505.4219	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	63.7495	63.9068	64.0618	64.8000	64.9400	65.5997	65.5997	65.7234	65.3440	64.9400	64.6574	64.3646
alpha	5.2500	5.2605	5.2708	5.3200	5.3293	5.3733	5.3733	5.3816	5.3563	5.3293	5.3105	5.2910
util living area	0.9949	0.9877	0.9696	0.9196	0.8087	0.6269	0.4611	0.4993	0.7359	0.9379	0.9884	0.9962 (86)
MIT	19.9645	20.1456	20.3910	20.6723	20.8786	20.9759	20.9961	20.9941	20.9442	20.6782	20.2660	19.9306 (87)
Th 2	20.0096	20.0117	20.0139	20.0240	20.0259	20.0348	20.0348	20.0364	20.0314	20.0259	20.0221	20.0181 (88)
util rest of house	0.9933	0.9838	0.9600	0.8945	0.7547	0.5424	0.3621	0.3981	0.6557	0.9129	0.9840	0.9950 (89)
MIT 2	18.6414	18.9051	19.2578	19.6537	19.9128	20.0195	20.0334	20.0341	19.9906	19.6711	19.0891	18.5982 (90)
Living area fraction									fLA = Living area / (4) =			0.3747 (91)
MIT	19.1372	19.3699	19.6824	20.0354	20.2747	20.3779	20.3941	20.3938	20.3479	20.0485	19.5301	19.0975 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1372	19.3699	19.6824	20.0354	20.2747	20.3779	20.3941	20.3938	20.3479	20.0485	19.5301	19.0975 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9914	0.9805	0.9560	0.8948	0.7695	0.5734	0.3994	0.4362	0.6835	0.9135	0.9811	0.9934	(94)
Useful gains	530.9976	617.1764	671.2617	677.8686	603.3708	436.2613	292.3832	306.4863	458.2355	551.6146	524.1938	502.0908	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1181.8134	1149.7216	1044.8867	872.5770	670.4705	447.2425	293.6861	308.5618	485.5167	738.7957	976.1833	1175.2742	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	484.2069	357.8703	277.9770	140.1900	49.9222	0.0000	0.0000	0.0000	0.0000	139.2627	325.4324	500.8484	(98)
Space heating												2275.7101	(98)
Space heating per m2												31.1229	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2433.9145 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	484.2069	357.8703	277.9770	140.1900	49.9222	0.0000	0.0000	0.0000	0.0000	139.2627	325.4324	500.8484	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	517.8684	382.7490	297.3017	149.9359	53.3927	0.0000	0.0000	0.0000	0.0000	148.9441	348.0560	535.6667	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	192.2450	169.4722	178.0463	159.6944	156.5588	139.9823	134.5249	147.4958	147.1978	165.5896	174.9838	187.6492	(64)
Efficiency of water heater (217)m	87.1780	86.7614	85.9979	84.4687	82.1483	79.8000	79.8000	79.8000	79.8000	84.3561	86.4468	87.3093	(217)
Fuel for water heating, kWh/month	220.5202	195.3314	207.0357	189.0575	190.5807	175.4164	168.5775	184.8318	184.4584	196.2982	202.4179	214.9246	(219)
Water heating fuel used													2329.4504 (219)
Annual totals kWh/year													
Space heating fuel - main system													2433.9145 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													75.0000 (231)
Electricity for lighting (calculated in Appendix L)													333.5691 (232)
Total delivered energy for all uses													5171.9341 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2433.9145	0.2160	525.7255 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2329.4504	0.2160	503.1613 (264)
Space and water heating			1028.8868 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	333.5691	0.5190	173.1224 (268)
Total CO2, kg/m2/year			1240.9342 (272)
Emissions per m2 for space and water heating			14.0712 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3676 (272b)
Emissions per m2 for pumps and fans			0.5323 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.0712 * 1.55) + 2.3676 + 0.5323, rounded to 2 d.p.			24.7100 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010512				Issued on Date	29/04/2022
Assessment Reference	037		Prop Type Ref			
Property						
SAP Rating	84 B	DER	13.20	TER	24.69	
Environmental	91 B	% DER<TER	46.54			
CO ₂ Emissions (t/year)	0.76	DFEE	37.45	TFEE	43.80	
General Requirements Compliance	Pass	% DFEE<TFEE	14.49			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 72 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 24.69 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.20 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)43.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)37.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing South West:	5.88 m ² , No overhang
Windows facing West:	3.92 m ² , No overhang
Windows facing North West:	2.55 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	353.11 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.0300 (1b)	x 2.5000 (2b)	= 180.0750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 180.0750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			12.3500	1.1450	14.1412		(27)
External Wall	39.7500	12.3500	27.4000	0.1500	4.1100		(29a)
Corridor	10.1800	1.8900	8.2900	0.2500	2.0725		(29a)
Main Roof	72.0300		72.0300	0.1000	7.2030		(30)
Total net area of external elements Aum(A, m ²)				121.9600			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.4167		(33)
Party Wall			37.2500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.6140 (36)
Total fabric heat loss							(33) + (36) = 38.0307 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	16.6426	16.4532	16.2638	15.3167	15.1273	14.1802	14.1802	13.9908	14.5591	15.1273	15.5061	15.8850 (38)
Heat transfer coeff	54.6734	54.4839	54.2945	53.3475	53.1580	52.2110	52.2110	52.0215	52.5898	53.1580	53.5369	53.9157 (39)
Average = Sum(39)m / 12 =												53.3001 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.7590	0.7564	0.7538	0.7406	0.7380	0.7249	0.7249	0.7222	0.7301	0.7380	0.7433	0.7485 (40)
HLP (average)												0.7400 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2944 (42)
Average daily hot water use (litres/day)												88.6916 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.5607	94.0131	90.4654	86.9177	83.3701	79.8224	79.8224	83.3701	86.9177	90.4654	94.0131	97.5607 (44)
Energy conte	144.6798	126.5378	130.5757	113.8391	109.2313	94.2583	87.3442	100.2287	101.4258	118.2020	129.0267	140.1146 (45)
Energy content (annual)												Total = Sum(45)m = 1395.4639 (45)
Distribution loss (46)m = 0.15 x (45)m	21.7020	18.9807	19.5864	17.0759	16.3847	14.1387	13.1016	15.0343	15.2139	17.7303	19.3540	21.0172 (46)

Water storage loss:												110.0000 (47)
Store volume												
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	(59)
Total heat required for water heating calculated for each month												
199.9566	176.4653	185.8525	167.3328	164.5081	147.7520	142.6210	155.5055	154.9194	173.4788	182.5204	195.9514	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
199.9566	176.4653	185.8525	167.3328	164.5081	147.7520	142.6210	155.5055	154.9194	173.4788	182.5204	195.9514	(64)
Total per year (kWh/year) = Sum(64)m =												2046.3037 (64)
Heat gains from water heating, kWh/month												
92.3275	82.0158	87.6379	80.6464	80.5408	74.1358	73.2634	77.5475	76.5190	83.5236	85.6963	90.8096	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.1753	16.1432	13.1285	9.9391	7.4296	6.2724	6.7775	8.8097	11.8244	15.0137	17.5233	18.6805 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9878	204.0838	198.8019	187.5575	173.3634	160.0230	151.1107	149.0147	154.2966	165.5410	179.7351	193.0756 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753 (71)
Water heating gains (Table 5)	124.0961	122.0473	117.7928	112.0089	108.2538	102.9664	98.4723	104.2305	106.2764	112.2629	119.0227	122.0559 (72)
Total internal gains	401.6749	399.6900	387.1390	366.9213	346.4626	326.6775	313.7763	319.4707	329.8131	350.2334	373.6968	391.2276 (73)

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Southwest				5.8800	36.7938	0.4000	0.8000	0.7700	47.9773 (79)			
West				3.9200	19.6403	0.4000	0.8000	0.7700	17.0733 (80)			
Northwest				2.5500	11.2829	0.4000	0.8000	0.7700	6.3084 (81)			
Solar gains	71.4309	128.1094	190.2195	257.1940	305.1504	309.7707	295.8612	259.4911	213.5576	145.8237	86.7822	60.3093 (83)
Total gains	473.1058	527.7994	577.3585	624.1152	651.6129	636.4482	609.6375	578.9618	543.3707	496.0571	460.4790	451.5369 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	91.4903	91.8084	92.1287	93.7642	94.0984	95.8052	95.8052	96.1541	95.1151	94.0984	93.4325	92.7760
alpha	7.0994	7.1206	7.1419	7.2509	7.2732	7.3870	7.3870	7.4103	7.3410	7.2732	7.2288	7.1851
util living area	0.9955	0.9891	0.9684	0.8931	0.7313	0.5229	0.3767	0.4130	0.6560	0.9211	0.9879	0.9966 (86)
MIT	20.3794	20.5012	20.6793	20.8758	20.9749	20.9981	20.9999	20.9997	20.9909	20.8648	20.5927	20.3589 (87)
Th 2	20.2890	20.2913	20.2936	20.3051	20.3074	20.3189	20.3189	20.3212	20.3143	20.3074	20.3028	20.2982 (88)
util rest of house	0.9941	0.9860	0.9594	0.8673	0.6853	0.4682	0.3185	0.3522	0.5956	0.8957	0.9838	0.9956 (89)
MIT 2	19.4586	19.6367	19.8922	20.1666	20.2847	20.3177	20.3189	20.3211	20.3078	20.1594	19.7793	19.4361 (90)
Living area fraction										fLA = Living area / (4) =		0.3762 (91)
MIT	19.8050	19.9620	20.1884	20.4334	20.5443	20.5737	20.5751	20.5764	20.5648	20.4248	20.0853	19.7833 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8050	19.9620	20.1884	20.4334	20.5443	20.5737	20.5751	20.5764	20.5648	20.4248	20.0853	19.7833 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9929	0.9842	0.9578	0.8724	0.7015	0.4888	0.3404	0.3751	0.6180	0.9005	0.9822	0.9946 (94)
Useful gains	469.7487	519.4377	553.0187	544.5056	457.0798	311.0704	207.4949	217.1693	335.8270	446.7044	452.2880	449.1109 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	847.7121	820.6352	743.2028	615.2790	470.1482	311.8916	207.5427	217.2645	339.9817	522.2664	695.1926	840.1841 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	281.2048	202.4047	141.4970	50.9568	9.7229	0.0000	0.0000	0.0000	0.0000	56.2181	174.8913	290.9585 (98)
Space heating												1207.8541 (98)
Space heating per m2												16.7688 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump	0.9500	(303a)
Fraction of heat from community Boilers	0.0500	(303b)
Fraction of total space heat from community Heat pump	0.9500	(304a)
Fraction of total space heat from community Boilers	0.0500	(304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.1800	(306)
Space heating:		
Annual space heating requirement	1207.8541	(98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1354.0044	(307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	71.2634	(307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	2046.3037	(64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2293.9064	(310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	120.7319	(310b)
Electricity used for heat distribution	38.3991	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	173.0071	(330a)
Total electricity for the above, kWh/year	173.0071	(331)
Electricity for lighting (calculated in Appendix L)	320.9819	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
Total delivered energy for all uses	4333.8951	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			250.0000	(367a)
Space heating from Heat pump	1459.1643	0.5190	757.3063	(367)
Efficiency of heat source Boilers			99.0000	(367b)
Space heating from Boilers	193.9347	0.5190	100.6521	(368)
Electrical energy for heat distribution	38.3991	0.5190	19.9291	(372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			877.8875	(373)
Space and water heating			877.8875	(376)
Pumps and fans	173.0071	0.5190	89.7907	(378)
Energy for lighting	320.9819	0.5190	166.5896	(379)
Energy saving/generation technologies				
PV Unit	-353.1100	0.5190	-183.2641	(380)
Total CO2, kg/year			951.0037	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			13.2000	(384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			13.2000	ZC1
Total Floor Area		TFA	72.0300	
Assumed number of occupants		N	2.2944	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.6172	ZC2
CO2 emissions from cooking, equation (L16)			2.4166	ZC3
Total CO2 emissions			32.2338	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			32.2338	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.0300 (1b)	x 2.5000 (2b)	= 180.0750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 180.0750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1666 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4166 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3541 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4515	0.4426	0.4338	0.3895	0.3807	0.3364	0.3364	0.3275	0.3541	0.3807	0.3984	0.4161 (22b)
Effective ac	0.6019	0.5980	0.5941	0.5759	0.5725	0.5566	0.5566	0.5536	0.5627	0.5725	0.5793	0.5866 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			12.3500	1.3258	16.3731		(27)
External Wall	39.7500	12.3500	27.4000	0.1800	4.9320		(29a)
Corridor	10.1800	1.8900	8.2900	0.1800	1.4922		(29a)
Main Roof	72.0300		72.0300	0.1300	9.3639		(30)
Total net area of external elements Aum(A, m ²)			121.9600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.0512		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.6349 (36)
Total fabric heat loss						(33) + (36) =	39.6861 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	35.7690	35.5338	35.3033	34.2205	34.0179	33.0748	33.0748	32.9002	33.4381	34.0179	34.4277	34.8562 (38)
Heat transfer coeff	75.4551	75.2199	74.9894	73.9066	73.7040	72.7609	72.7609	72.5863	73.1242	73.7040	74.1138	74.5423 (39)
Average = Sum(39)m / 12 =												73.9056 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0476	1.0443	1.0411	1.0261	1.0232	1.0101	1.0101	1.0077	1.0152	1.0232	1.0289	1.0349 (40)
HLP (average)												1.0260 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2944 (42)
Average daily hot water use (litres/day)												88.6916 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.5607	94.0131	90.4654	86.9177	83.3701	79.8224	79.8224	83.3701	86.9177	90.4654	94.0131	97.5607 (44)
Energy conte	144.6798	126.5378	130.5757	113.8391	109.2313	94.2583	87.3442	100.2287	101.4258	118.2020	129.0267	140.1146 (45)
Energy content (annual)										Total = Sum(45)m =		1395.4639 (45)
Distribution loss (46)m = 0.15 x (45)m	21.7020	18.9807	19.5864	17.0759	16.3847	14.1387	13.1016	15.0343	15.2139	17.7303	19.3540	21.0172 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	191.2747	168.6236	177.1706	158.9309	155.8262	139.3501	133.9391	146.8236	146.5176	164.7969	174.1185	186.7095 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	191.2747	168.6236	177.1706	158.9309	155.8262	139.3501	133.9391	146.8236	146.5176	164.7969	174.1185	186.7095 (64)
Heat gains from water heating, kWh/month	85.3819	75.7424	80.6923	73.9250	73.5953	67.4144	66.3179	70.6020	69.7975	76.5781	78.9748	83.8640 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	114.7191	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5438	16.4704	13.3947	10.1406	7.5802	6.3996	6.9149	8.9883	12.0641	15.3181	17.8785	19.0592	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.9878	204.0838	198.8019	187.5575	173.3634	160.0230	151.1107	149.0147	154.2966	165.5410	179.7351	193.0756	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	34.4719	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	-91.7753	(71)
Water heating gains (Table 5)	114.7607	112.7119	108.4575	102.6736	98.9185	93.6311	89.1369	94.8951	96.9410	102.9275	109.6873	112.7205	(72)
Total internal gains	395.7080	393.6819	381.0698	360.7874	340.2778	320.4693	307.5783	313.3139	323.7174	344.2024	367.7166	385.2710	(73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Southwest			5.8800		36.7938		0.6300		0.7000		0.7700		66.1187 (79)
West			3.9200		19.6403		0.6300		0.7000		0.7700		23.5291 (80)
Northwest			2.5500		11.2829		0.6300		0.7000		0.7700		8.7929 (81)
Solar gains	98.4407	176.5508	262.1463	354.4454	420.5353	426.9027	407.7337	357.6112	294.3091	200.9633	119.5968	83.1138	(83)
Total gains	494.1487	570.2327	643.2161	715.2328	760.8132	747.3720	715.3120	670.9251	618.0265	545.1657	487.3134	468.3847	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	66.2922	66.4995	66.7039	67.6812	67.8672	68.7468	68.7468	68.9122	68.4053	67.8672	67.4919	67.1040	
alpha	5.4195	5.4333	5.4469	5.5121	5.5245	5.5831	5.5831	5.5941	5.5604	5.5245	5.4995	5.4736	
util living area	0.9962	0.9911	0.9758	0.9238	0.7993	0.6056	0.4448	0.4926	0.7505	0.9507	0.9913	0.9971	(86)
MIT	19.9798	20.1413	20.3885	20.6884	20.8968	20.9825	20.9973	20.9954	20.9455	20.6687	20.2706	19.9542	(87)
Th 2	20.0439	20.0466	20.0492	20.0617	20.0640	20.0749	20.0749	20.0769	20.0707	20.0640	20.0593	20.0544	(88)
util rest of house	0.9949	0.9882	0.9679	0.8999	0.7459	0.5255	0.3528	0.3964	0.6730	0.9300	0.9881	0.9962	(89)
MIT 2	18.6889	18.9254	19.2826	19.7075	19.9682	20.0638	20.0739	20.0751	20.0302	19.6916	19.1240	18.6593	(90)
Living area fraction	19.1746	19.3829	19.6987	20.0766	20.3176	20.4095	20.4213	20.4213	20.3746	20.0592	19.5554	19.1465	(91)
MIT	19.1746	19.3829	19.6987	20.0766	20.3176	20.4095	20.4213	20.4213	20.3746	20.0592	19.5554	19.1465	(92)
Temperature adjustment	19.1746	19.3829	19.6987	20.0766	20.3176	20.4095	20.4213	20.4213	20.3746	20.0592	19.5554	19.1465	(93)
adjusted MIT	19.1746	19.3829	19.6987	20.0766	20.3176	20.4095	20.4213	20.4213	20.3746	20.0592	19.5554	19.1465	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	490.8885	562.0390	620.2586	643.9593	579.2351	414.8963	277.1730	290.3205	432.5421	506.9373	480.3485	466.0112	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1122.3629	1089.4009	989.7603	826.0221	635.1517	422.7022	278.0440	291.8946	458.8237	697.1806	923.1159	1114.1434	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	469.8170	354.3872	274.9093	131.0852	41.6019	0.0000	0.0000	0.0000	0.0000	141.5410	318.7925	482.2104	(98)
Space heating												2214.3445	(98)
Space heating per m2												30.7420	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2368.2828 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	469.8170	354.3872	274.9093	131.0852	41.6019	0.0000	0.0000	0.0000	0.0000	141.5410	318.7925	482.2104	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	502.4781	379.0237	294.0206	140.1981	44.4940	0.0000	0.0000	0.0000	0.0000	151.3807	340.9546	515.7330	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	191.2747	168.6236	177.1706	158.9309	155.8262	139.3501	133.9391	146.8236	146.5176	164.7969	174.1185	186.7095	(64)
Efficiency of water heater (217)m	87.1202	86.7498	85.9818	84.3053	81.8389	79.8000	79.8000	79.8000	79.8000	84.4112	86.4073	87.2351	(216)
Fuel for water heating, kWh/month	219.5527	194.3792	206.0559	188.5183	190.4060	174.6242	167.8435	183.9895	183.6060	195.2310	201.5090	214.0302	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													2368.2828 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													75.0000 (231)
Electricity for lighting (calculated in Appendix L)													327.4893 (232)
Total delivered energy for all uses													5090.5177 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2368.2828	0.2160	511.5491 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2319.7455	0.2160	501.0650 (264)
Space and water heating			1012.6141 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	327.4893	0.5190	169.9670 (268)
Total CO2, kg/m2/year			1221.5061 (272)
Emissions per m2 for space and water heating			14.0582 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3597 (272b)
Emissions per m2 for pumps and fans			0.5404 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.0582 * 1.55) + 2.3597 + 0.5404, rounded to 2 d.p.			24.6900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010513	Issued on Date	29/04/2022
Assessment Reference	038	Prop Type Ref	
Property			
SAP Rating	82 B	DER	14.86
Environmental	91 B	TER	28.41
CO ₂ Emissions (t/year)	0.61	% DER<TER	47.69
General Requirements Compliance	Fail	DFEE	41.49
		TFEE	47.64
		% DFEE<TFEE	12.89
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 28.41 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.86 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 47.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 41.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading: Average
Windows facing North East: 6.24 m², No overhang
Windows facing East: 2.21 m², No overhang
Windows facing North West: 1.97 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 353.11 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			10.4200	1.1450	11.9313		(27)
External Wall	40.6000	10.4200	30.1800	0.1500	4.5270		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Total net area of external elements Aum(A, m ²)			58.1000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.2508		(33)
Party Wall			16.2500	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K	250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	7.3600 (36)
Total fabric heat loss	(33) + (36) = 29.6108 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	11.7351	11.6015	11.4680	10.8002	10.6666	9.9988	9.9988	9.8652	10.2659	10.6666	10.9337	11.2009 (38)
Average = Sum(39)m / 12 =	41.3459	41.2123	41.0788	40.4110	40.2774	39.6096	39.6096	39.4760	39.8767	40.2774	40.5445	40.8117 (39)
												40.3776 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8141	0.8114	0.8088	0.7956	0.7930	0.7799	0.7799	0.7772	0.7851	0.7930	0.7983	0.8035 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7134 (42)
Average daily hot water use (litres/day)	74.8927 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	30.9817	(56)
If cylinder contains dedicated solar storage													
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	30.9817	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	(59)
Total heat required for water heating calculated for each month													
177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	173.5921	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	173.5921	(64)
Heat gains from water heating, kWh/month													
84.8430	75.4698	80.8830	74.7574	74.8902	69.2597	68.7450	72.3625	71.2721	77.4089	79.0216	83.5613	83.5613	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
13.3089	11.8209	9.6134	7.2779	5.4403	4.5930	4.9629	6.4509	8.6584	10.9938	12.8314	13.6788	13.6788	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)													
114.0363	112.3063	108.7138	103.8297	100.6589	96.1941	92.3992	97.2615	98.9891	104.0442	109.7522	112.3135	112.3135	(72)
Total internal gains													
325.3314	323.6625	313.9587	298.4287	282.9297	267.7578	257.7459	262.5472	270.3860	286.0871	304.1233	317.3917	317.3917	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Northeast				6.2400	11.2829	0.4000	0.8000	0.7700	15.6131 (75)			
East				2.2100	19.6403	0.4000	0.8000	0.7700	9.6255 (76)			
Northwest				1.9700	11.2829	0.4000	0.8000	0.7700	4.9291 (81)			
Solar gains	30.1678	60.6439	106.3458	168.9493	221.7346	234.0410	219.8802	178.6279	127.8638	73.4433	37.8494	24.6914 (83)
Total gains	355.4992	384.3064	420.3045	467.3780	504.6643	501.7988	477.6261	441.1750	398.2498	359.5304	341.9727	342.0831 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	85.3067	85.5832	85.8614	87.2803	87.5698	89.0462	89.0462	89.3474	88.4497	87.5698	86.9928	86.4234
alpha	6.6871	6.7055	6.7241	6.8187	6.8380	6.9364	6.9364	6.9565	6.8966	6.8380	6.7995	6.7616
util living area	0.9942	0.9890	0.9697	0.8909	0.7146	0.5030	0.3647	0.4111	0.6733	0.9286	0.9866	0.9954 (86)
MIT	20.3362	20.4415	20.6292	20.8565	20.9725	20.9978	20.9998	20.9996	20.9861	20.8318	20.5531	20.3189 (87)
Th 2	20.2412	20.2434	20.2457	20.2571	20.2594	20.2708	20.2708	20.2731	20.2662	20.2594	20.2548	20.2503 (88)
util rest of house	0.9925	0.9858	0.9609	0.8640	0.6663	0.4467	0.3044	0.3464	0.6087	0.9041	0.9820	0.9941 (89)
MIT 2	19.3577	19.5118	19.7814	20.0975	20.2348	20.2694	20.2707	20.2729	20.2562	20.0740	19.6832	19.3397 (90)
Living area fraction												
MIT	19.8489	19.9785	20.2071	20.4786	20.6051	20.6351	20.6368	20.6377	20.6227	20.4545	20.1199	19.8313 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8489	19.9785	20.2071	20.4786	20.6051	20.6351	20.6368	20.6377	20.6227	20.4545	20.1199	19.8313 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9914	0.9844	0.9604	0.8726	0.6893	0.4749	0.3347	0.3789	0.6407	0.9112	0.9810	0.9931	(94)
Useful gains	352.4429	378.3143	403.6471	407.8292	347.8892	238.3166	159.8413	167.1671	255.1517	327.6147	335.4615	339.7178	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	642.8852	621.4223	563.0690	467.9023	358.6763	239.0492	159.8950	167.2892	260.1023	396.9132	527.8877	637.9400	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	216.0891	163.3686	118.6098	43.2526	8.0256	0.0000	0.0000	0.0000	0.0000	51.5581	138.5469	221.8773	(98)
Space heating													961.3281 (98)
Space heating per m2													(98) / (4) = 18.9275 (99)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	961.3281 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1077.6488 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	56.7184 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2050.5266 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	107.9225 (310b)
Electricity used for heat distribution	32.9282 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	235.0396 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	3649.8471 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1251.2702	0.5190	649.4092 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	166.3039	0.5190	86.3117 (368)
Electrical energy for heat distribution	32.9282	0.5190	17.0897 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			752.8106 (373)
Space and water heating			752.8106 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	235.0396	0.5190	121.9856 (379)
Energy saving/generation technologies			
PV Unit	-353.1100	0.5190	-183.2641 (380)
Total CO2, kg/year			754.8455 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.8600 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		14.8600 ZC1
Total Floor Area	TFA	50.7900
Assumed number of occupants	N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.4175 ZC2
CO2 emissions from cooking, equation (L16)		3.1526 ZC3
Total CO2 emissions		35.4301 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		35.4301 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1575 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4075 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3464 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4416	0.4330	0.4243	0.3810	0.3724	0.3291	0.3291	0.3204	0.3464	0.3724	0.3897	0.4070 (22b)
Effective ac	0.5975	0.5937	0.5900	0.5726	0.5693	0.5541	0.5541	0.5513	0.5600	0.5693	0.5759	0.5828 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900			(26)				
TER Opening Type (Uw = 1.40)			10.4200	1.3258	13.8144			(27)				
External Wall	40.6000	10.4200	30.1800	0.1800	5.4324			(29a)				
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098			(29a)				
Total net area of external elements Aum(A, m2)			58.1000					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.9466			(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								5.5926 (36)				
Total fabric heat loss						(33) + (36) =		29.5392 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	25.0373	24.8786	24.7230	23.9925	23.8558	23.2195	23.2195	23.1017	23.4646	23.8558	24.1323	24.4214 (38)
Heat transfer coeff	54.5765	54.4178	54.2622	53.5317	53.3950	52.7587	52.7587	52.6409	53.0038	53.3950	53.6715	53.9606 (39)
Average = Sum(39)m / 12 =												53.5310 (39)
HLP	1.0746	1.0714	1.0684	1.0540	1.0513	1.0388	1.0388	1.0364	1.0436	1.0513	1.0567	1.0624 (40)
HLP (average)												1.0540 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

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If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.3700	11.8751	9.6575	7.3113	5.4653	4.6140	4.9856	6.4805	8.6981	11.0443	12.8903	13.7416	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.0571	317.3814	307.6675	292.1267	276.6192	261.4435	251.4333	256.2414	264.0903	279.8021	297.8468	311.1191	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
Northeast				6.2400	11.2829	0.6300	0.7000			0.7700			21.5169 (75)
East				2.2100	19.6403	0.6300	0.7000			0.7700			13.2651 (76)
Northwest				1.9700	11.2829	0.6300	0.7000			0.7700			6.7930 (81)
Solar gains	41.5750	83.5749	146.5578	232.8333	305.5780	322.5377	303.0224	246.1715	176.2122	101.2141	52.1611	34.0278	83)
Total gains	360.6321	400.9562	454.2252	524.9600	582.1973	583.9812	554.4557	502.4129	440.3026	381.0162	350.0080	345.1469	84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	64.6265	64.8149	65.0007	65.8878	66.0564	66.8531	66.8531	67.0027	66.5440	66.0564	65.7161	65.3641	
alpha	5.3084	5.3210	5.3334	5.3925	5.4038	5.4569	5.4569	5.4668	5.4363	5.4038	5.3811	5.3576	
util living area	0.9956	0.9915	0.9767	0.9174	0.7698	0.5656	0.4166	0.4773	0.7570	0.9550	0.9909	0.9965	(86)
MIT	19.9643	20.1022	20.3559	20.6874	20.9089	20.9861	20.9978	20.9956	20.9389	20.6395	20.2490	19.9428	(87)
Th 2	20.0217	20.0242	20.0268	20.0386	20.0408	20.0512	20.0512	20.0531	20.0472	20.0408	20.0363	20.0316	(88)
util rest of house	0.9942	0.9887	0.9690	0.8920	0.7134	0.4872	0.3279	0.3815	0.6785	0.9355	0.9874	0.9953	(89)
MIT 2	18.6500	18.8521	19.2190	19.6857	19.9581	20.0426	20.0504	20.0514	20.0017	19.6336	19.0756	18.6260	(90)
Living area fraction									fLA = Living area / (4) =			0.5021	(91)
MIT	19.3099	19.4797	19.7898	20.1886	20.4354	20.5163	20.5260	20.5254	20.4722	20.1386	19.6647	19.2871	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3099	19.4797	19.7898	20.1886	20.4354	20.5163	20.5260	20.5254	20.4722	20.1386	19.6647	19.2871	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9928	0.9867	0.9668	0.8964	0.7377	0.5262	0.3725	0.4297	0.7154	0.9378	0.9857	0.9942	(94)
Ext temp.	358.0257	395.6336	439.1291	470.5782	429.5135	307.2901	206.5299	215.9024	315.0139	357.3198	344.9934	343.1348	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	819.1869	793.3967	721.1333	604.2979	466.4291	312.1359	207.1330	217.1656	337.7521	509.3143	674.3690	814.1100	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	343.1039	267.2968	209.8111	96.2782	27.4652	0.0000	0.0000	0.0000	0.0000	113.0839	237.1504	350.4056	(98)
												1644.5951	(98)
												32.3803	(99)

8c. Space cooling requirement

Not applicable

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9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1758.9252 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	343.1039	267.2968	209.8111	96.2782	27.4652	0.0000	0.0000	0.0000	0.0000	113.0839	237.1504	350.4056	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	366.9561	285.8789	224.3969	102.9713	29.3745	0.0000	0.0000	0.0000	0.0000	120.9454	253.6368	374.7653	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	86.6685	86.3567	85.5905	83.8173	81.3893	79.8000	79.8000	79.8000	79.8000	84.1350	85.9613	86.7765	(216)
Fuel for water heating, kWh/month	194.7247	172.4666	183.2625	168.4849	170.5774	156.2471	150.8144	164.4484	163.8315	174.0140	179.2020	190.0402	(219)
Water heating fuel used												2068.1137	(219)
Annual totals kWh/year													
Space heating fuel - main system												1758.9252	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												236.1179	(232)
Total delivered energy for all uses												4138.1568	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1758.9252	0.2160	379.9278 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2068.1137	0.2160	446.7126 (264)
Space and water heating			826.6404 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	236.1179	0.5190	122.5452 (268)
Total CO2, kg/m2/year			988.1106 (272)
Emissions per m2 for space and water heating			16.2757 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4128 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.2757 * 1.55) + 2.4128 + 0.7664, rounded to 2 d.p.			28.4100 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010514	Issued on Date	29/04/2022
Assessment Reference	044	Prop Type Ref	
Property			
SAP Rating	81 B	DER	16.77
Environmental	90 B	TER	31.40
CO ₂ Emissions (t/year)	0.68	% DER<TER	46.60
General Requirements Compliance	Pass	DFEE	48.72
		TFEE	57.58
		% DFEE<TFEE	15.38
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 31.40 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.77 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)57.6 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)48.7 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing North East:	6.24 m ² , No overhang
Windows facing East:	2.21 m ² , No overhang
Windows facing North West:	1.97 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	353.11 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			10.4200	1.1450	11.9313		(27)
External Wall	40.6000	10.4200	30.1800	0.1500	4.5270		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Main Roof	50.7900		50.7900	0.1000	5.0790		(30)
Total net area of external elements Aum(A, m ²)			108.8900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.3298		(33)
Party Wall			16.2500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.4552 (36)
Total fabric heat loss							(33) + (36) = 35.7850 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	11.7351	11.6015	11.4680	10.8002	10.6666	9.9988	9.9988	9.8652	10.2659	10.6666	10.9337	11.2009 (38)
Heat transfer coeff	47.5201	47.3865	47.2530	46.5852	46.4516	45.7838	45.7838	45.6502	46.0509	46.4516	46.7187	46.9859 (39)
Average = Sum(39)m / 12 =												46.5518 (39)
HLP	0.9356	0.9330	0.9304	0.9172	0.9146	0.9014	0.9014	0.8988	0.9067	0.9146	0.9198	0.9251 (40)
HLP (average)												0.9166 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum (63)m =													0.0000 (63)
Output from w/h	177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(64)
Total per year (kWh/year) = Sum (64)m =													1829.1942 (64)
Heat gains from water heating, kWh/month													
	84.8430	75.4698	80.8830	74.7574	74.8902	69.2597	68.7450	72.3625	71.2721	77.4089	79.0216	83.5613	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.3089	11.8209	9.6134	7.2779	5.4403	4.5930	4.9629	6.4509	8.6584	10.9938	12.8314	13.6788 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	114.0363	112.3063	108.7138	103.8297	100.6589	96.1941	92.3992	97.2615	98.9891	104.0442	109.7522	112.3135 (72)
Total internal gains	325.3314	323.6625	313.9587	298.4287	282.9297	267.7578	257.7459	262.5472	270.3860	286.0871	304.1233	317.3917 (73)

[Jan	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	6.2400	11.2829	0.4000	0.8000	0.7700	15.6131 (75)
East	2.2100	19.6403	0.4000	0.8000	0.7700	9.6255 (76)
Northwest	1.9700	11.2829	0.4000	0.8000	0.7700	4.9291 (81)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9927	0.9874	0.9700	0.9069	0.7553	0.5393	0.3813	0.4315	0.7096	0.9352	0.9850	0.9940 (94)
Useful gains	352.8922	379.4560	407.6755	423.8558	381.1719	270.6216	182.0994	190.3886	282.5841	336.2252	336.8306	340.0422 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	726.3590	702.3720	636.7748	531.3736	409.3167	273.6775	182.4066	191.0191	296.9523	450.0697	597.6480	721.9731 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	277.8593	216.9995	170.4499	77.4128	20.9397	0.0000	0.0000	0.0000	0.0000	84.7003	187.7885	284.1566 (98)
Space heating												1320.3066 (98)
Space heating per m2												25.9954 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1320.3066 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1480.0637 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	77.8981 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2050.5266 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	107.9225 (310b)
Electricity used for heat distribution	37.1641 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	235.0396 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	4073.4417 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			250.0000 (367a)	
Space heating from Heat pump	1412.2361	0.5190	732.9506 (367)	
Efficiency of heat source Boilers			99.0000 (367b)	
Space heating from Boilers	187.6975	0.5190	97.4150 (368)	
Electrical energy for heat distribution	37.1641	0.5190	19.2882 (372)	
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			849.6537 (373)	
Space and water heating			849.6537 (376)	
Pumps and fans	121.9912	0.5190	63.3134 (378)	
Energy for lighting	235.0396	0.5190	121.9856 (379)	
Energy saving/generation technologies				
PV Unit	-353.1100	0.5190	-183.2641 (380)	
Total CO2, kg/year			851.6887 (383)	
Dwelling Carbon Dioxide Emission Rate (DER)			16.7700 (384)	

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			16.7700 ZC1
Total Floor Area		TFA	50.7900
Assumed number of occupants		N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			17.4175 ZC2
CO2 emissions from cooking, equation (L16)			3.1526 ZC3
Total CO2 emissions			37.3401 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			37.3401 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.1575 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4075 (18)
Number of sides sheltered					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3464 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4416	0.4330	0.4243	0.3810	0.3724	0.3291	0.3291	0.3204	0.3464	0.3724	0.3897	0.4070 (22b)
	0.5975	0.5937	0.5900	0.5726	0.5693	0.5541	0.5541	0.5513	0.5600	0.5693	0.5759	0.5828 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			10.4200	1.3258	13.8144		(27)
External Wall	40.6000	10.4200	30.1800	0.1800	5.4324		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Main Roof	50.7900		50.7900	0.1300	6.6027		(30)
Total net area of external elements Aum(A, m ²)			108.8900				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 30.5493		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.6050 (36)
Total fabric heat loss							(33) + (36) = 37.1543 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	25.0373	24.8786	24.7230	23.9925	23.8558	23.2195	23.2195	23.1017	23.4646	23.8558	24.1323	24.4214 (38)
Heat transfer coeff	62.1916	62.0329	61.8773	61.1468	61.0101	60.3738	60.3738	60.2560	60.6189	61.0101	61.2866	61.5757 (39)
Average = Sum(39)m / 12 =												61.1461 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2245	1.2214	1.2183	1.2039	1.2012	1.1887	1.1887	1.1864	1.1935	1.2012	1.2067	1.2124 (40)
HLP (average)												1.2039 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
Heat gains from water heating, kWh/month	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.3700	11.8751	9.6575	7.3113	5.4653	4.6140	4.9856	6.4805	8.6981	11.0443	12.8903	13.7416	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.0571	317.3814	307.6675	292.1267	276.6192	261.4435	251.4333	256.2414	264.0903	279.8021	297.8468	311.1191	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
Northeast				6.2400	11.2829	0.6300	0.7000			0.7700			21.5169 (75)
East				2.2100	19.6403	0.6300	0.7000			0.7700			13.2651 (76)
Northwest				1.9700	11.2829	0.6300	0.7000			0.7700			6.7930 (81)
Solar gains	41.5750	83.5749	146.5578	232.8333	305.5780	322.5377	303.0224	246.1715	176.2122	101.2141	52.1611	34.0278	(83)
Total gains	360.6321	400.9562	454.2252	524.9600	582.1973	583.9812	554.4557	502.4129	440.3026	381.0162	350.0080	345.1469	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.7132	56.8583	57.0012	57.6822	57.8115	58.4207	58.4207	58.5350	58.1845	57.8115	57.5506	57.2804	
alpha	4.7809	4.7906	4.8001	4.8455	4.8541	4.8947	4.8947	4.9023	4.8790	4.8541	4.8367	4.8187	
util living area	0.9958	0.9924	0.9808	0.9364	0.8183	0.6292	0.4722	0.5379	0.8079	0.9646	0.9920	0.9966 (86)	
MIT	19.7604	19.9033	20.1750	20.5453	20.8333	20.9652	20.9930	20.9873	20.8853	20.5109	20.0763	19.7376 (87)	
Th 2	19.9005	19.9029	19.9054	19.9169	19.9190	19.9291	19.9291	19.9309	19.9252	19.9190	19.9147	19.9101 (88)	
util rest of house	0.9944	0.9898	0.9741	0.9141	0.7620	0.5372	0.3609	0.4198	0.7275	0.9477	0.9888	0.9955 (89)	
MIT 2	18.2663	18.4758	18.8701	19.3971	19.7639	19.9074	19.9266	19.9260	19.8371	19.3624	18.7371	18.2398 (90)	
Living area fraction	19.0164	19.1925	19.5252	19.9736	20.3008	20.4385	20.4620	20.4588	20.3633	19.9390	19.4095	18.9918 (92)	
Temperature adjustment	19.0164	19.1925	19.5252	19.9736	20.3008	20.4385	20.4620	20.4588	20.3633	19.9390	19.4095	18.9918 (93)	
adjusted MIT	19.0164	19.1925	19.5252	19.9736	20.3008	20.4385	20.4620	20.4588	20.3633	19.9390	19.4095	18.9918 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9929	0.9876	0.9711	0.9154	0.7834	0.5823	0.4170	0.4794	0.7632	0.9481	0.9868	0.9942 (94)
Useful gains	358.0747	396.0004	441.1144	480.5646	456.1139	340.0500	231.2062	240.8342	336.0334	361.2411	345.3837	343.1426 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	915.2378	886.6055	805.9668	677.1140	524.7376	352.4906	233.1647	244.5682	379.6771	569.7735	754.4066	910.8126 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	414.5293	329.6866	271.4502	141.5155	51.0561	0.0000	0.0000	0.0000	0.0000	155.1481	294.4965	422.3464 (98)
Space heating												2080.2289 (98)
Space heating per m2												40.9574 (99)
										(98) / (4) =		

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2224.8437 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	414.5293	329.6866	271.4502	141.5155	51.0561	0.0000	0.0000	0.0000	0.0000	155.1481	294.4965	422.3464	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	443.3469	352.6060	290.3211	151.3535	54.6054	0.0000	0.0000	0.0000	0.0000	165.9338	314.9695	451.7074	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	87.1202	86.8752	86.2640	84.8194	82.4201	79.8000	79.8000	79.8000	79.8000	84.9686	86.5160	87.2160	(216)
Fuel for water heating, kWh/month	193.7152	171.4373	181.8318	166.4943	168.4440	156.2471	150.8144	164.4484	163.8315	172.3068	178.0529	189.0824	(219)
Water heating fuel used												2056.7062	(219)
Annual totals kWh/year													
Space heating fuel - main system												2224.8437	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												236.1179	(232)
Total delivered energy for all uses												4592.6678	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2224.8437	0.2160	480.5662 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2056.7062	0.2160	444.2485 (264)
Space and water heating			924.8148 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	236.1179	0.5190	122.5452 (268)
Total CO2, kg/m2/year			1086.2850 (272)
Emissions per m2 for space and water heating			18.2086 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4128 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (18.2086 * 1.55) + 2.4128 + 0.7664, rounded to 2 d.p.			31.4000 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010515	Issued on Date	29/04/2022
Assessment Reference	045	Prop Type Ref	
Property			
SAP Rating	84 B	DER	13.71
Environmental	90 B	TER	24.06
CO ₂ Emissions (t/year)	0.95	% DER<TER	43.01
General Requirements Compliance	Fail	DFEE	40.77
		TFEE	47.41
		% DFEE<TFEE	14.00
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 88 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 24.06 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.71 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)47.4 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)40.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing North East:	12.71 m ² , No overhang
Windows facing East:	1.37 m ² , No overhang
Windows facing South East:	7.38 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	353.11 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	87.5200 (1b)	x 2.5000 (2b)	= 218.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 218.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			21.4600	1.1450	24.5725		(27)
External Wall	45.5300	21.4600	24.0700	0.1500	3.6105		(29a)
Corridor	10.9800	1.8900	9.0900	0.2500	2.2725		(29a)
Main Roof	87.5200		87.5200	0.1000	8.7520		(30)
Total net area of external elements Aum(A, m ²)				144.0300			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.0975		(33)
Party Wall			39.6000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.1896 (36)
Total fabric heat loss							(33) + (36) = 53.2871 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	20.2216	19.9915	19.7613	18.6106	18.3804	17.2297	17.2297	16.9995	17.6900	18.3804	18.8407	19.3010 (38)
Average = Sum(39)m / 12 =	73.5088	73.2786	73.0485	71.8977	71.6675	70.5168	70.5168	70.2866	70.9771	71.6675	72.1279	72.5882 (39)
												71.8402 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8399	0.8373	0.8346	0.8215	0.8189	0.8057	0.8057	0.8031	0.8110	0.8189	0.8241	0.8294 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5902 (42)
Average daily hot water use (litres/day)												95.7180 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	105.2898	101.4611	97.6323	93.8036	89.9749	86.1462	86.1462	89.9749	93.8036	97.6323	101.4611	105.2898 (44)
Energy content (annual)	156.1417	136.5625	140.9203	122.8577	117.8849	101.7257	94.2638	108.1691	109.4610	127.5662	139.2485	151.2149 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1506.0165 (45)
	23.4213	20.4844	21.1380	18.4287	17.6827	15.2589	14.1396	16.2254	16.4192	19.1349	20.8873	22.6822 (46)

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	211.4185	186.4900	196.1971	176.3514	173.1617	155.2194	149.5406	163.4459	162.9547	182.8430	192.7422	206.4917	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
	Solar input (sum of months) = Sum (63)m =												0.0000 (63)
Output from w/h													
	211.4185	186.4900	196.1971	176.3514	173.1617	155.2194	149.5406	163.4459	162.9547	182.8430	192.7422	206.4917	(64)
	Total per year (kWh/year) = Sum (64)m =												2156.8562 (64)
Heat gains from water heating, kWh/month													
	96.1386	85.3490	91.0774	83.6451	83.4182	76.6187	75.5642	80.1877	79.1907	86.6372	89.0951	94.5004	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.9005	18.5637	15.0970	11.4294	8.5436	7.2129	7.7938	10.1306	13.5973	17.2649	20.1507	21.4814 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	234.4405	236.8732	230.7428	217.6917	201.2171	185.7333	175.3892	172.9564	179.0869	192.1379	208.6125	224.0963 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092 (71)
Water heating gains (Table 5)	129.2185	127.0074	122.4159	116.1738	112.1212	106.4149	101.5647	107.7791	109.9871	116.4479	123.7432	127.0167 (72)
Total internal gains	446.4130	444.2978	430.1091	407.1484	383.7354	361.2145	346.6011	352.7196	364.5248	387.7042	414.3599	434.4479 (73)

[Jan]			Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				
Northeast			12.7100	11.2829	0.4000	0.8000	0.7700	31.8018 (75)				
East			1.3700	19.6403	0.4000	0.8000	0.7700	5.9669 (76)				
Southeast			7.3800	36.7938	0.4000	0.8000	0.7700	60.2164 (77)				
Solar gains	97.9851	178.9767	276.1939	393.4643	486.5955	503.0205	476.6833	404.3119	316.4320	206.3224	119.5802	82.4105 (83)
Total gains	544.3980	623.2745	706.3030	800.6127	870.3309	864.2350	823.2844	757.0316	680.9567	594.0265	533.9401	516.8584 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil/m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	82.6810	82.9407	83.2020	84.5337	84.8052	86.1891	86.1891	86.4713	85.6301	84.8052	84.2640	83.7296
alpha	6.5121	6.5294	6.5468	6.6356	6.6537	6.7459	6.7459	6.7648	6.7087	6.6537	6.6176	6.5820
util living area	0.9972	0.9926	0.9754	0.9022	0.7309	0.5191	0.3765	0.4263	0.6952	0.9456	0.9927	0.9980 (86)
MIT	20.2213	20.3615	20.5784	20.8315	20.9653	20.9969	20.9997	20.9993	20.9813	20.7903	20.4609	20.1981 (87)
Th 2	20.2189	20.2211	20.2234	20.2347	20.2370	20.2484	20.2484	20.2507	20.2438	20.2370	20.2325	20.2279 (88)
util rest of house	0.9963	0.9903	0.9679	0.8766	0.6815	0.4595	0.3124	0.3573	0.6284	0.9250	0.9900	0.9973 (89)
MIT 2	19.1731	19.3787	19.6917	20.0456	20.2058	20.2464	20.2483	20.2504	20.2302	20.0009	19.5331	19.1464 (90)
Living area fraction	19.1731	19.3787	19.6917	20.0456	20.2058	20.2464	20.2483	20.2504	20.2302	20.0009	19.5331	19.1464 (90)
MIT	19.3683	19.5618	19.8569	20.1920	20.3472	20.3862	20.3882	20.3899	20.3701	20.1479	19.7059	19.3423 (91)
Temperature adjustment												0.0000
adjusted MIT	19.3683	19.5618	19.8569	20.1920	20.3472	20.3862	20.3882	20.3899	20.3701	20.1479	19.7059	19.3423 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9950	0.9878	0.9635	0.8750	0.6889	0.4705	0.3244	0.3702	0.6400	0.9222	0.9876	0.9963 (94)
Useful gains	541.6727	615.6718	680.5362	700.5525	599.6006	406.6578	267.0415	280.2206	435.7962	547.7942	527.3194	514.9438 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1107.6554	1074.3949	975.6979	811.8689	619.7255	408.0246	267.1324	280.4341	445.0312	684.2749	909.2348	1099.1485 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	421.0912	308.2619	219.6003	80.1478	14.9729	0.0000	0.0000	0.0000	0.0000	101.5416	274.9791	434.6483 (98)
Space heating												1855.2431 (99)
Space heating per m2										(98) / (4) =		21.1979 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump	0.9500	(303a)
Fraction of heat from community Boilers	0.0500	(303b)
Fraction of total space heat from community Heat pump	0.9500	(304a)
Fraction of total space heat from community Boilers	0.0500	(304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.1800	(306)
Space heating:		
Annual space heating requirement	1855.2431	(98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	2079.7275	(307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	109.4593	(307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	2156.8562	(64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2417.8358	(310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	127.2545	(310b)
Electricity used for heat distribution	47.3428	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	210.2121	(330a)
Total electricity for the above, kWh/year	210.2121	(331)
Electricity for lighting (calculated in Appendix L)	369.1100	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
Total delivered energy for all uses	5313.5994	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			250.0000	(367a)
Space heating from Heat pump	1799.0253	0.5190	933.6942	(367)
Efficiency of heat source Boilers			99.0000	(367b)
Space heating from Boilers	239.1049	0.5190	124.0954	(368)
Electrical energy for heat distribution	47.3428	0.5190	24.5709	(372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1082.3605	(373)
Space and water heating			1082.3605	(376)
Pumps and fans	210.2121	0.5190	109.1001	(378)
Energy for lighting	369.1100	0.5190	191.5681	(379)
Energy saving/generation technologies				
PV Unit	-353.1100	0.5190	-183.2641	(380)
Total CO2, kg/year			1199.7646	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			13.7100	(384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			13.7100	ZC1
Total Floor Area		TFA	87.5200	
Assumed number of occupants		N	2.5902	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			15.8735	ZC2
CO2 emissions from cooking, equation (L16)			2.0700	ZC3
Total CO2 emissions			31.6534	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			31.6534	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	87.5200 (1b)	x 2.5000 (2b)	= 218.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 218.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 30.0000 / (5) = 0.1371 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3871 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3290 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4195	0.4113	0.4031	0.3619	0.3537	0.3126	0.3126	0.3044	0.3290	0.3537	0.3702	0.3866 (22b)
	0.5880	0.5846	0.5812	0.5655	0.5626	0.5489	0.5489	0.5463	0.5541	0.5626	0.5685	0.5747 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			20.0000	1.3258	26.5152		(27)
External Wall	45.5300	20.0000	25.5300	0.1800	4.5954		(29a)
Corridor	10.9800	1.8900	9.0900	0.1800	1.6362		(29a)
Main Roof	87.5200		87.5200	0.1300	11.3776		(30)
Total net area of external elements Aum(A, m ²)			144.0300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.0144		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.7258 (36)
Total fabric heat loss						(33) + (36) =	54.7402 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	42.4562	42.2095	41.9676	40.8316	40.6191	39.6297	39.6297	39.4465	40.0108	40.6191	41.0491	41.4986 (38)
Heat transfer coeff	97.1964	96.9496	96.7078	95.5718	95.3592	94.3698	94.3698	94.1866	94.7509	95.3592	95.7892	96.2387 (39)
Average = Sum(39)m / 12 =												95.5708 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1106	1.1077	1.1050	1.0920	1.0896	1.0783	1.0783	1.0762	1.0826	1.0896	1.0945	1.0996 (40)
HLP (average)												1.0920 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5902 (42)
Average daily hot water use (litres/day)												95.7180 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	105.2898	101.4611	97.6323	93.8036	89.9749	86.1462	86.1462	89.9749	93.8036	97.6323	101.4611	105.2898 (44)
Energy conte	156.1417	136.5625	140.9203	122.8577	117.8849	101.7257	94.2638	108.1691	109.4610	127.5662	139.2485	151.2149 (45)
Energy content (annual)										Total = Sum(45)m =		1506.0165 (45)
Distribution loss (46)m = 0.15 x (45)m	23.4213	20.4844	21.1380	18.4287	17.6827	15.2589	14.1396	16.2254	16.4192	19.1349	20.8873	22.6822 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	202.7366	178.6482	187.5152	167.9496	164.4798	146.8176	140.8587	154.7640	154.5528	174.1611	184.3404	197.8098 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	202.7366	178.6482	187.5152	167.9496	164.4798	146.8176	140.8587	154.7640	154.5528	174.1611	184.3404	197.8098 (64)
Heat gains from water heating, kWh/month	89.1930	79.0756	84.1319	76.9237	76.4727	69.8973	68.6186	73.2422	72.4693	79.6917	82.3736	87.5549 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115	129.5115 (66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	20.9005	18.5637	15.0970	11.4294	8.5436	7.2129	7.7938	10.1306	13.5973	17.2649	20.1507	21.4814 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	234.4405	236.8732	230.7428	217.6917	201.2171	185.7333	175.3892	172.9564	179.0869	192.1379	208.6125	224.0963 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512	35.9512 (69)	
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)	
Losses e.g. evaporation (negative values) (Table 5)	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092	-103.6092 (71)	
Water heating gains (Table 5)	119.8831	117.6720	113.0805	106.8384	102.7858	97.0795	92.2294	98.4438	100.6517	107.1125	114.4078	117.6813 (72)	
Total internal gains	440.0776	437.9624	423.7737	400.8130	377.4000	354.8792	340.2657	346.3842	358.1894	381.3688	408.0245	428.1125 (73)	

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
Northeast					11.8500	11.2829	0.6300	0.7000			0.7700			40.8613 (75)
East					1.2800	19.6403	0.6300	0.7000			0.7700			7.6830 (76)
Southeast					6.8700	36.7938	0.6300	0.7000			0.7700			77.2509 (77)
Solar gains	125.7952	229.7908	354.6482	505.2835	624.9212	646.0304	612.1995	519.2294	406.3346	264.9111	153.5227	105.7982	(83)	
Total gains	565.8728	667.7532	778.4220	906.0965	1002.3212	1000.9095	952.4653	865.6137	764.5240	646.2798	561.5471	533.9107	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	62.5309	62.6901	62.8468	63.5939	63.7356	64.4038	64.4038	64.5291	64.1448	63.7356	63.4495	63.1531	
alpha	5.1687	5.1793	5.1898	5.2396	5.2490	5.2936	5.2936	5.3019	5.2763	5.2490	5.2300	5.2102	
util living area	0.9972	0.9929	0.9785	0.9229	0.7845	0.5862	0.4329	0.4941	0.7684	0.9605	0.9936	0.9979 (86)	
MIT	19.8555	20.0290	20.3069	20.6527	20.8909	20.9813	20.9968	20.9939	20.9280	20.5975	20.1615	19.8260 (87)	
Th 2	19.9922	19.9945	19.9968	20.0074	20.0094	20.0186	20.0186	20.0203	20.0151	20.0094	20.0053	20.0011 (88)	
util rest of house	0.9963	0.9906	0.9712	0.8982	0.7279	0.5036	0.3380	0.3922	0.6887	0.9426	0.9911	0.9972 (89)	
MIT 2	18.4701	18.7243	19.1264	19.6140	19.9096	20.0071	20.0175	20.0180	19.9611	19.5516	18.9263	18.4335 (90)	
Living area fraction	18.7282	18.9673	19.3463	19.8074	20.0924	20.1885	20.1999	20.1997	20.1412	19.7464	19.1563	18.6929 (92)	
Temperature adjustment	18.7282	18.9673	19.3463	19.8074	20.0924	20.1885	20.1999	20.1997	20.1412	19.7464	19.1563	18.6929 (93)	
adjusted MIT	18.7282	18.9673	19.3463	19.8074	20.0924	20.1885	20.1999	20.1997	20.1412	19.7464	19.1563	18.6929 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	562.7631	659.2128	751.2260	808.5679	734.7430	518.8393	338.7894	355.9347	535.1004	605.2783	554.8283	531.6916 (95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W	1402.3647	1363.8225	1242.3352	1042.4416	800.2884	527.3865	339.7229	357.8845	572.4078	872.1914	1154.8659	1394.7750 (97)	
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)	
Space heating kWh	624.6636	473.4977	365.3852	168.3891	48.7658	0.0000	0.0000	0.0000	0.0000	198.5833	432.0270	642.1340 (98)	
Space heating												2953.4459 (98)	
Space heating per m2												33.7460 (99)	

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3158.7656 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	624.6636	473.4977	365.3852	168.3891	48.7658	0.0000	0.0000	0.0000	0.0000	198.5833	432.0270	642.1340	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	668.0894	506.4147	390.7864	180.0953	52.1559	0.0000	0.0000	0.0000	0.0000	212.3886	462.0610	686.7744	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	202.7366	178.6482	187.5152	167.9496	164.4798	146.8176	140.8587	154.7640	154.5528	174.1611	184.3404	197.8098	(64)
Efficiency of water heater (217)m	87.6212	87.2936	86.5635	84.8208	82.0176	79.8000	79.8000	79.8000	79.8000	85.1644	87.0107	87.7297	(216)
Fuel for water heating, kWh/month	231.3784	204.6522	216.6214	198.0051	200.5422	183.9819	176.5147	193.9399	193.6752	204.4998	211.8594	225.4764	(219)
Water heating fuel used												2441.1466	(219)
Annual totals kWh/year													
Space heating fuel - main system												3158.7656	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												369.1100	(232)
Total delivered energy for all uses												6044.0222	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3158.7656	0.2160	682.2934 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2441.1466	0.2160	527.2877 (264)
Space and water heating			1209.5810 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	369.1100	0.5190	191.5681 (268)
Total CO2, kg/m2/year			1440.0741 (272)
Emissions per m2 for space and water heating			13.8206 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.1888 (272b)
Emissions per m2 for pumps and fans			0.4448 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.8206 * 1.55) + 2.1888 + 0.4448, rounded to 2 d.p.			24.0600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010516			Issued on Date	29/04/2022
Assessment Reference	046	Prop Type Ref			
Property					
SAP Rating	84 B	DER	13.13	TER	23.08
Environmental	90 B	% DER<TER	43.10		
CO ₂ Emissions (t/year)	0.91	DFEE	38.07	TFEE	42.93
General Requirements Compliance	Pass	% DFEE<TFEE	11.32		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 87 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 23.08 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.13 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)42.9 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)38.1 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing South East:	1.97 m ² , No overhang
Windows facing South:	3.92 m ² , No overhang
Windows facing South West:	8.41 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	353.11 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	87.0000 (1b)	x 2.5000 (2b)	= 217.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 217.5000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) =	0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			14.3000	1.1450	16.3740		(27)
External Wall	44.9800	14.3000	30.6800	0.1500	4.6020		(29a)
Corridor	15.5500	1.8900	13.6600	0.2500	3.4150		(29a)
Core	18.2300		18.2300	0.2500	4.5575		(29a)
Main Roof	87.0000		87.0000	0.1000	8.7000		(30)
Total net area of external elements Aum(A, m ²)			165.7600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.5385		(33)
Party Wall			18.8500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.9176 (36)
Total fabric heat loss						(33) + (36) =	50.4561 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	20.1015	19.8727	19.6439	18.5000	18.2712	17.1273	17.1273	16.8985	17.5849	18.2712	18.7288	19.1864 (38)
Heat transfer coeff	70.5576	70.3288	70.1001	68.9562	68.7274	67.5835	67.5835	67.3547	68.0410	68.7274	69.1849	69.6425 (39)
Average = Sum(39)m / 12 =												68.8990 (39)
HLP	0.8110	0.8084	0.8057	0.7926	0.7900	0.7768	0.7768	0.7742	0.7821	0.7900	0.7952	0.8005 (40)
HLP (average)												0.7919 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5824 (42)
Average daily hot water use (litres/day)												95.5318 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	105.0850	101.2637	97.4424	93.6211	89.7999	85.9786	85.9786	89.7999	93.6211	97.4424	101.2637	105.0850 (44)
Energy conte	155.8380	136.2969	140.6462	122.6187	117.6556	101.5278	94.0805	107.9587	109.2481	127.3181	138.9777	150.9207 (45)
Energy content (annual)										Total = Sum(45)m =		1503.0869 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	23.3757	20.4445	21.0969	18.3928	17.6483	15.2292	14.1121	16.1938	16.3872	19.0977	20.8466	22.6381 (46)
Water storage loss:												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
211.1148	186.2243	195.9230	176.1124	172.9324	155.0215	149.3573	163.2355	162.7418	182.5949	192.4713	206.1975	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h												
211.1148	186.2243	195.9230	176.1124	172.9324	155.0215	149.3573	163.2355	162.7418	182.5949	192.4713	206.1975	(64)
Heat gains from water heating, kWh/month												
96.0376	85.2607	90.9863	83.5657	83.3419	76.5529	75.5032	80.1177	79.1199	86.5547	89.0050	94.4026	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
21.1208	18.7593	15.2561	11.5499	8.6337	7.2889	7.8759	10.2374	13.7406	17.4469	20.3631	21.7078	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
233.4490	235.8715	229.7669	216.7711	200.3661	184.9478	174.6474	172.2249	178.3295	191.3253	207.7303	223.1486	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	(71)
Water heating gains (Table 5)												
129.0827	126.8760	122.2934	116.0634	112.0187	106.3235	101.4828	107.6851	109.8888	116.3370	123.6181	126.8852	(72)
Total internal gains												
445.3884	443.2426	429.0523	406.1202	382.7544	360.2961	345.7420	351.8833	363.6948	386.8451	413.4473	433.4775	(73)

6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains
		m2	Table 6a	or Table 6b	Specific data	factor	W
			W/m2		or Table 6c	Table 6d	
Southeast		1.9700	36.7938	0.4000	0.8000	0.7700	16.0740 (77)
South		3.9200	46.7521	0.4000	0.8000	0.7700	40.6415 (78)
Southwest		8.4100	36.7938	0.4000	0.8000	0.7700	68.6206 (79)

Solar gains	125.3361	210.8266	282.1774	340.4041	373.8044	368.0651	356.0989	331.4779	302.3021	231.2365	149.6187	107.5989 (83)
Total gains	570.7245	654.0692	711.2297	746.5243	756.5588	728.3612	701.8409	683.3612	665.9969	618.0815	563.0660	541.0764 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	85.6274	85.9060	86.1863	87.6161	87.9077	89.3956	89.6993	88.7945	87.9077	87.3263	86.7526	
alpha	6.7085	6.7271	6.7458	6.8411	6.8605	6.9597	6.9597	6.9800	6.9196	6.8605	6.7835	
util living area	0.9960	0.9893	0.9712	0.9155	0.7887	0.5873	0.4231	0.4524	0.6852	0.9267	0.9891	0.9971 (86)
MIT	20.2983	20.4415	20.6249	20.8257	20.9509	20.9945	20.9995	20.9992	20.9848	20.8360	20.5329	20.2731 (87)
Th 2	20.2438	20.2461	20.2484	20.2598	20.2620	20.2735	20.2735	20.2758	20.2689	20.2620	20.2575	20.2529 (88)
util rest of house	0.9948	0.9862	0.9627	0.8924	0.7420	0.5235	0.3536	0.3817	0.6204	0.9018	0.9853	0.9962 (89)
MIT 2	19.3048	19.5139	19.7776	20.0617	20.2162	20.2699	20.2733	20.2754	20.2578	20.0816	19.6565	19.2753 (90)
Living area fraction									fLA = Living area / (4) =			0.1782 (91)
MIT	19.4818	19.6792	19.9286	20.1978	20.3471	20.3990	20.4027	20.4044	20.3873	20.2160	19.8126	19.4531 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4818	19.6792	19.9286	20.1978	20.3471	20.3990	20.4027	20.4044	20.3873	20.2160	19.8126	19.4531 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	566.7894	643.0093	681.6107	664.6185	565.6741	389.4747	256.8468	269.4651	420.4221	556.2896	553.0934	538.3291 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1071.1942	1039.4022	941.3446	779.0561	594.2936	391.9163	256.9965	269.7134	427.7970	660.8811	879.5237	1062.2650 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	375.2771	266.3760	193.2420	82.3950	21.2929	0.0000	0.0000	0.0000	0.0000	77.8161	235.0299	389.8083 (98)
Space heating												1641.2373 (98)
Space heating per m2												18.8648 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1641.2373 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1839.8270 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	96.8330 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2153.9267 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2414.5518 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	127.0817 (310b)
Electricity used for heat distribution	44.7829 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	208.9631 (330a)
Total electricity for the above, kWh/year	208.9631 (331)
Electricity for lighting (calculated in Appendix L)	373.0005 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	5060.2571 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1701.7515	0.5190	883.2091 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	226.1764	0.5190	117.3856 (368)
Electrical energy for heat distribution	44.7829	0.5190	23.2423 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1023.8370 (373)
Space and water heating			1023.8370 (376)
Pumps and fans	208.9631	0.5190	108.4519 (378)
Energy for lighting	373.0005	0.5190	193.5872 (379)
Energy saving/generation technologies			
PV Unit	-353.1100	0.5190	-183.2641 (380)
Total CO2, kg/year			1142.6120 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			13.1300 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES
DER

Total Floor Area	TFA	13.1300 ZC1
Assumed number of occupants	N	87.0000
CO2 emission factor in Table 12 for electricity displaced from grid	EF	2.5824
CO2 emissions from appliances, equation (L14)		0.5190
CO2 emissions from cooking, equation (L16)		15.9008 ZC2
Total CO2 emissions		2.0802 ZC3
Residual CO2 emissions offset from biofuel CHP		31.1110 ZC4
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC5
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC6
Net CO2 emissions		0.0000 ZC7
		31.1110 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	87.0000 (1b)	x 2.5000 (2b)	= 217.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 217.5000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1379 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3879 (18)
Number of sides sheltered					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3297 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4204	0.4122	0.4039	0.3627	0.3545	0.3133	0.3133	0.3050	0.3297	0.3545	0.3710	0.3874 (22b)
Effective ac	0.5884	0.5849	0.5816	0.5658	0.5628	0.5491	0.5491	0.5465	0.5544	0.5628	0.5688	0.5751 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			14.3000	1.3258	18.9583		(27)					
External Wall	44.9800	14.3000	30.6800	0.1800	5.5224		(29a)					
Corridor	15.5500	1.8900	13.6600	0.1800	2.4588		(29a)					
Core	18.2300		18.2300	0.1800	3.2814		(29a)					
Main Roof	87.0000		87.0000	0.1300	11.3100		(30)					
Total net area of external elements Aum(A, m2)			165.7600				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	43.4209		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.5358 (36)					
Total fabric heat loss						(33) + (36) =	51.9567 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 42.2307	Feb 41.9844	Mar 41.7430	Apr 40.6090	May 40.3968	Jun 39.4091	Jul 39.4091	Aug 39.2262	Sep 39.7895	Oct 40.3968	Nov 40.8260	Dec 41.2747 (38)
Heat transfer coeff	94.1875	93.9411	93.6997	92.5657	92.3535	91.3658	91.3658	91.1829	91.7463	92.3535	92.7827	93.2315 (39)
Average = Sum(39)m / 12 =												92.5647 (39)
HLP	Jan 1.0826	Feb 1.0798	Mar 1.0770	Apr 1.0640	May 1.0615	Jun 1.0502	Jul 1.0502	Aug 1.0481	Sep 1.0546	Oct 1.0615	Nov 1.0665	Dec 1.0716 (40)
HLP (average)												1.0640 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5824	(42)
Average daily hot water use (litres/day)												95.5318	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	105.0850	101.2637	97.4424	93.6211	89.7999	85.9786	85.9786	89.7999	93.6211	97.4424	101.2637	105.0850	(44)
Energy conte	155.8380	136.2969	140.6462	122.6187	117.6556	101.5278	94.0805	107.9587	109.2481	127.3181	138.9777	150.9207	(45)
Energy content (annual)													
										Total = Sum(45)m =		1503.0869	(45)
Distribution loss (46)m = 0.15 x (45)m													
	23.3757	20.4445	21.0969	18.3928	17.6483	15.2292	14.1121	16.1938	16.3872	19.0977	20.8466	22.6381	(46)
Water storage loss:													
Store volume													
												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	202.4329	178.3826	187.2411	167.7106	164.2505	146.6197	140.6754	154.5536	154.3399	173.9130	184.0695	197.5156 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	202.4329	178.3826	187.2411	167.7106	164.2505	146.6197	140.6754	154.5536	154.3399	173.9130	184.0695	197.5156 (64)
Heat gains from water heating, kWh/month	89.0920	78.9873	84.0408	76.8442	76.3964	69.8315	68.5577	73.1722	72.3985	79.6092	82.2835	87.4571 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)m
(66)m	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	129.1195	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.5997	19.1847	15.6020	11.8117	8.8294	7.4542	8.0545	10.4695	14.0522	17.8425	20.8248	22.2000	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	233.4490	235.8715	229.7669	216.7711	200.3661	184.9478	174.6474	172.2249	178.3295	191.3253	207.7303	223.1486	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	35.9120	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	-103.2956	(71)
Water heating gains (Table 5)	119.7474	117.5406	112.9580	106.7281	102.6833	96.9882	92.1474	98.3497	100.5534	107.0016	114.2827	117.5498	(72)
Total internal gains	439.5320	437.3326	423.0628	400.0467	376.6147	354.1260	339.5852	345.7801	357.6709	380.9053	407.5736	427.6343	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	

Southeast					1.9700	36.7938		0.6300	0.7000	0.7700		22.1520 (77)	
South					3.9200	46.7521		0.6300	0.7000	0.7700		56.0091 (78)	
Southwest					8.4100	36.7938		0.6300	0.7000	0.7700		94.5677 (79)	

Solar gains	172.7288	290.5453	388.8757	469.1194	515.1492	507.2397	490.7488	456.8180	416.6101	318.6728	206.1932	148.2848	(83)
Total gains	612.2608	727.8780	811.9386	869.1661	891.7639	861.3657	830.3340	802.5980	774.2810	699.5780	613.7669	575.9191	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	64.1451	64.3133	64.4790	65.2690	65.4189	66.1261	66.1261	66.2588	65.8519	65.4189	65.1163	64.8029
alpha	5.2763	5.2876	5.2986	5.3513	5.3613	5.4084	5.4084	5.4173	5.3901	5.3613	5.3411	5.3202
util living area	0.9958	0.9890	0.9726	0.9279	0.8265	0.6496	0.4792	0.5151	0.7480	0.9427	0.9900	0.9969 (86)
MIT	19.9473	20.1334	20.3776	20.6562	20.8664	20.9723	20.9954	20.9933	20.9408	20.6698	20.2523	19.9135 (87)
Th 2	20.0151	20.0174	20.0197	20.0304	20.0324	20.0417	20.0417	20.0435	20.0381	20.0324	20.0283	20.0241 (88)
util rest of house	0.9944	0.9856	0.9638	0.9047	0.7747	0.5643	0.3775	0.4119	0.6686	0.9192	0.9862	0.9959 (89)
MIT 2	18.6203	18.8918	19.2437	19.6385	19.9060	20.0239	20.0401	20.0408	19.9944	19.6659	19.0743	18.5777 (90)
Living area fraction	18.8567	19.1130	19.4457	19.8198	20.0771	20.1928	20.2103	20.2105	fLA = Living area / (4) =	20.1630	19.8447	19.2841
MIT	18.8567	19.1130	19.4457	19.8198	20.0771	20.1928	20.2103	20.2105	20.1630	19.8447	19.2841	18.8157 (91)
Temperature adjustment	18.8567	19.1130	19.4457	19.8198	20.0771	20.1928	20.2103	20.2105	20.1630	19.8447	19.2841	18.8157 (92)
adjusted MIT	18.8567	19.1130	19.4457	19.8198	20.0771	20.1928	20.2103	20.2105	20.1630	19.8447	19.2841	18.8157 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	607.4144	714.1873	777.1670	781.1171	693.2492	498.2046	328.5036	345.3315	526.2914	639.1239	602.7933	572.5007	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1371.0607	1335.1880	1213.0100	1010.7996	773.6545	510.9941	329.8565	347.4540	556.2613	853.7847	1130.4779	1362.6414	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	568.1529	417.3125	324.2672	165.3714	59.8216	0.0000	0.0000	0.0000	0.0000	159.7076	379.9329	587.8647	(98)
Space heating												2662.4308	(98)
Space heating per m ²												30.6027	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												2847.5195 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	568.1529	417.3125	324.2672	165.3714	59.8216	0.0000	0.0000	0.0000	0.0000	159.7076	379.9329	587.8647 (98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000 (210)
Space heating fuel (main heating system)	607.6501	446.3235	346.8098	176.8678	63.9803	0.0000	0.0000	0.0000	0.0000	170.8103	406.3454	628.7323 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	202.4329	178.3826	187.2411	167.7106	164.2505	146.6197	140.6754	154.5536	154.3399	173.9130	184.0695	197.5156 (64)
Efficiency of water heater (217)m	87.4207	87.0065	86.2658	84.7765	82.4010	79.8000	79.8000	79.8000	79.8000	84.5876	86.7057	79.8000 (216)
Fuel for water heating, kWh/month	231.5618	205.0222	217.0513	197.8268	199.3307	183.7339	176.2849	193.6762	193.4084	205.6012	212.2922	225.6090 (219)
Water heating fuel used												2441.3986 (219)
Annual totals kWh/year												
Space heating fuel - main system												2847.5195 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												381.4579 (232)
Total delivered energy for all uses												5745.3760 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2847.5195	0.2160	615.0642 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2441.3986	0.2160	527.3421 (264)
Space and water heating			1142.4063 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	381.4579	0.5190	197.9766 (268)
Total CO2, kg/m2/year			1379.3080 (272)
Emissions per m2 for space and water heating			13.1311 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.2756 (272b)
Emissions per m2 for pumps and fans			0.4474 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.1311 * 1.55) + 2.2756 + 0.4474, rounded to 2 d.p.			23.0800 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010517	Issued on Date	29/04/2022
Assessment Reference	047	Prop Type Ref	
Property			
SAP Rating	81 B	DER	18.23
Environmental	89 B	TER	30.62
CO ₂ Emissions (t/year)	0.76	% DER<TER	40.47
General Requirements Compliance	Pass	DFEE	49.70
		TFEE	54.20
		% DFEE<TFEE	8.31
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Ground-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 30.62 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 18.23 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 54.2 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 49.7 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.22 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room stats OK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing South East:	6.24 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	221.90 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.8200 (1b)	x 2.8000 (2b)	= 142.2960 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 142.2960 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					0.0000 / (5) = 0.0000 (8)
Measured/design AP50					Yes
Infiltration rate					3.0000
Number of sides sheltered					0.1500 (18)
					3 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)
Ground Floor			50.8200	0.1000	5.0820		(28a)
External Wall	25.7000	8.4500	17.2500	0.1500	2.5875		(29a)
Corridor	39.3700	1.8900	37.4800	0.2500	9.3700		(29a)
Total net area of external elements Aum(A, m ²)			115.8900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.6051		(33)
Party Wall 1			18.3700	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.4650 (36)
Total fabric heat loss						(33) + (36) =	38.0701 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	12.4775	12.3411	12.2046	11.5222	11.3858	10.7034	10.7034	10.5669	10.9764	11.3858	11.6587	11.9317 (38)
Average = Sum(39)m / 12 =	50.5476	50.4111	50.2747	49.5923	49.4558	48.7735	48.7735	48.6370	49.0464	49.4558	49.7288	50.0017 (39)
												49.5582 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9946	0.9920	0.9893	0.9758	0.9732	0.9597	0.9597	0.9570	0.9651	0.9732	0.9785	0.9839 (40)
Days in month												0.9752 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7143 (42)
Average daily hot water use (litres/day)												74.9137 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.4051	79.4086	76.4120	73.4155	70.4189	67.4224	67.4224	70.4189	73.4155	76.4120	79.4086	82.4051 (44)
Energy content (annual)	122.2044	106.8808	110.2914	96.1547	92.2627	79.6157	73.7757	84.6586	85.6697	99.8398	108.9830	118.3484 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1178.6849 (45)
	18.3307	16.0321	16.5437	14.4232	13.8394	11.9424	11.0663	12.6988	12.8505	14.9760	16.3474	17.7523 (46)

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	177.4812	156.8082	165.5682	149.6484	147.5395	133.1094	129.0525	139.9354	139.1634	155.1166	162.4766	173.6253	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum (63)m =													0.0000 (63)
Output from w/h													
	177.4812	156.8082	165.5682	149.6484	147.5395	133.1094	129.0525	139.9354	139.1634	155.1166	162.4766	173.6253	(64)
Total per year (kWh/year) = Sum (64)m =													1829.5247 (64)
Heat gains from water heating, kWh/month													
	84.8544	75.4798	80.8933	74.7664	74.8988	69.2672	68.7518	72.3704	71.2801	77.4182	79.0318	83.5723	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.7131	85.7131	85.7131	85.7131	85.7131	85.7131	85.7131	85.7131	85.7131	85.7131	85.7131	85.7131 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.4920	11.9835	9.7456	7.3781	5.5152	4.6562	5.0311	6.5397	8.7775	11.1451	13.0080	13.8670 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.3634	150.9134	147.0076	138.6927	128.1966	118.3318	111.7415	110.1916	114.0973	122.4122	132.9083	142.7731 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5713	31.5713	31.5713	31.5713	31.5713	31.5713	31.5713	31.5713	31.5713	31.5713	31.5713	31.5713 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705 (71)
Water heating gains (Table 5)	114.0516	112.3211	108.7276	103.8422	100.6704	96.2044	92.4084	97.2721	99.0002	104.0567	109.7664	112.3284 (72)
Total internal gains	325.6210	323.9319	314.1948	298.6269	283.0962	267.9063	257.8950	262.7173	270.5890	286.3280	304.3966	317.6824 (73)

[Jan				Area	Solar flux		g		FF		Access		Gains
				m2	Table 6a		Table 6b		Table 6c		factor		W
					W/m2		or Table 6b		or Table 6c		Table 6d		
Southeast				6.2400	36.7938		0.4000		0.8000		0.7700		50.9147 (77)
South				2.2100	46.7521		0.4000		0.8000		0.7700		22.9127 (78)
Solar gains	73.8274	124.2516	166.4633	201.0539	220.9821	217.6723	210.5612	195.8614	178.4200	136.3256	88.1434	63.3710 (83)	
Total gains	399.4484	448.1835	480.6581	499.6808	504.0783	485.5786	468.4562	458.5787	449.0090	422.6536	392.5400	381.0535 (84)	

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil/m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	69.8187	70.0077	70.1977	71.1636	71.3600	72.3583	72.3583	72.5613	71.9556	71.3600	70.9683	70.5809
alpha	5.6546	5.6672	5.6798	5.7442	5.7573	5.8239	5.8239	5.8374	5.7970	5.7573	5.7312	5.7054
util living area	0.9923	0.9842	0.9659	0.9176	0.8103	0.6244	0.4555	0.4841	0.7115	0.9216	0.9827	0.9940 (86)
MIT	20.1484	20.2950	20.4961	20.7298	20.9017	20.9829	20.9976	20.9966	20.9637	20.7617	20.4173	20.1210 (87)
Th 2	20.0878	20.0900	20.0923	20.1035	20.1058	20.1170	20.1170	20.1193	20.1125	20.1058	20.1013	20.0968 (88)
util rest of house	0.9899	0.9795	0.9556	0.8929	0.7592	0.5461	0.3655	0.3934	0.6359	0.8933	0.9767	0.9921 (89)
MIT 2	18.9663	19.1794	19.4676	19.7976	20.0135	20.1060	20.1161	20.1179	20.0862	19.8469	19.3660	18.9334 (90)
Living area fraction									fLA = Living area / (4) =			0.5024 (91)
MIT	19.5602	19.7398	19.9842	20.2659	20.4597	20.5465	20.5590	20.5594	20.5271	20.3065	19.8942	19.5300 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5602	19.7398	19.9842	20.2659	20.4597	20.5465	20.5590	20.5594	20.5271	20.3065	19.8942	19.5300 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9882	0.9773	0.9541	0.8979	0.7806	0.5850	0.4108	0.4391	0.6725	0.9005	0.9750	0.9906 (94)
Useful gains	394.7272	437.9964	458.6035	448.6475	393.4846	284.0475	192.4405	201.3438	301.9429	380.5793	382.7171	377.4671 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	771.3643	748.0935	677.9155	563.6615	433.2179	290.0326	193.0928	202.2992	315.2244	480.0414	636.2377	766.5247 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	280.2180	208.3852	163.1681	82.8101	29.5616	0.0000	0.0000	0.0000	0.0000	73.9998	182.5348	289.4589 (98)
Space heating												1310.1365 (98)
Space heating per m2												25.7799 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1310.1365 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1468.6631 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	77.2981 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.5247 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2050.8972 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	107.9420 (310b)
Electricity used for heat distribution	37.0480 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	136.7109 (330a)
Total electricity for the above, kWh/year	136.7109 (331)
Electricity for lighting (calculated in Appendix L)	238.2733 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	4079.7845 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			250.0000 (367a)	
Space heating from Heat pump	1407.8241	0.5190	730.6607 (367)	
Efficiency of heat source Boilers			99.0000 (367b)	
Space heating from Boilers	187.1111	0.5190	97.1107 (368)	
Electrical energy for heat distribution	37.0480	0.5190	19.2279 (372)	
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			846.9993 (373)	
Space and water heating			846.9993 (376)	
Pumps and fans	136.7109	0.5190	70.9529 (378)	
Energy for lighting	238.2733	0.5190	123.6639 (379)	
Energy saving/generation technologies				
PV Unit	-221.9000	0.5190	-115.1661 (380)	
Total CO2, kg/year			926.4500 (383)	
Dwelling Carbon Dioxide Emission Rate (DER)			18.2300 (384)	

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		18.2300 ZC1
Total Floor Area	TFA	50.8200
Assumed number of occupants	N	1.7143
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.4163 ZC2
CO2 emissions from cooking, equation (L16)		3.1512 ZC3
Total CO2 emissions		38.7975 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		38.7975 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.8200 (1b)	x 2.8000 (2b)	= 142.2960 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 142.2960 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1406 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3906 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3027 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.3859	0.3783	0.3708	0.3329	0.3254	0.2875	0.2875	0.2800	0.3027	0.3254	0.3405	0.3556 (22b)
Effective ac	0.5745	0.5716	0.5687	0.5554	0.5529	0.5413	0.5413	0.5392	0.5458	0.5529	0.5580	0.5632 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)
Ground Floor			50.8200	0.1300	6.6066		(28a)
External Wall	25.7000	8.4500	17.2500	0.1800	3.1050		(29a)
Corridor	39.3700	1.8900	37.4800	0.1800	6.7464		(29a)
Total net area of external elements Aum(A, m ²)			115.8900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.5507		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.9910 (36)
Total fabric heat loss						(33) + (36) =	37.5417 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	26.9755	26.8398	26.7067	26.0815	25.9646	25.4201	25.4201	25.3193	25.6298	25.9646	26.2012	26.4485 (38)
Heat transfer coeff	64.5172	64.3814	64.2483	63.6232	63.5062	62.9618	62.9618	62.8609	63.1715	63.5062	63.7428	63.9902 (39)
Average = Sum(39)m / 12 =												63.6226 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2695	1.2669	1.2642	1.2519	1.2496	1.2389	1.2389	1.2369	1.2430	1.2496	1.2543	1.2592 (40)
HLP (average)												1.2519 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7143 (42)
Average daily hot water use (litres/day)												74.9137 (43)
Daily hot water use	82.4051	79.4086	76.4120	73.4155	70.4189	67.4224	67.4224	70.4189	73.4155	76.4120	79.4086	82.4051 (44)
Energy conte	122.2044	106.8808	110.2914	96.1547	92.2627	79.6157	73.7757	84.6586	85.6697	99.8398	108.9830	118.3484 (45)
Energy content (annual)										Total = Sum(45)m =		1178.6849 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3307	16.0321	16.5437	14.4232	13.8394	11.9424	11.0663	12.6988	12.8505	14.9760	16.3474	17.7523 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												

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Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	168.7993	148.9665	156.8863	141.2465	138.8576	124.7075	120.3706	131.2535	130.7616	146.4347	154.0748	164.9434 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	168.7993	148.9665	156.8863	141.2465	138.8576	124.7075	120.3706	131.2535	130.7616	146.4347	154.0748	164.9434 (64)
Heat gains from water heating, kWh/month	77.9089	69.2064	73.9478	68.0449	67.9533	62.5457	61.8063	65.4249	64.5587	70.4727	72.3103	76.6268 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.7131	85.7131	85.7131	85.7131	85.7131	85.7131	85.7131	85.7131	85.7131	85.7131	85.7131	85.7131 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7897	12.2479	9.9606	7.5408	5.6369	4.7589	5.1421	6.6840	8.9712	11.3910	13.2950	14.1729 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.3634	150.9134	147.0076	138.6927	128.1966	118.3318	111.7415	110.1916	114.0973	122.4122	132.9083	142.7731 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5713	31.5713	31.5713	31.5713	31.5713	31.5713	31.5713	31.5713	31.5713	31.5713	31.5713	31.5713 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705	-68.5705 (71)
Water heating gains (Table 5)	104.7162	102.9858	99.3922	94.5068	91.3350	86.8690	83.0730	87.9367	89.6648	94.7213	100.4310	102.9930 (72)
Total internal gains	319.5833	317.8609	308.0744	292.4543	276.8825	261.6737	251.6706	256.5262	264.4473	280.2385	298.3482	311.6530 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W
Southeast					6.2400	36.7938	0.6300	0.7000	0.7700			70.1668 (77)
South					2.2100	46.7521	0.6300	0.7000	0.7700			31.5766 (78)
Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains	421.3267	489.0952	537.4816	569.5317	581.4234	561.6534	541.8503	526.4477	510.3323	468.1122	419.8208	398.9862 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	54.7012	54.8165	54.9301	55.4698	55.5720	56.0525	56.0525	56.1425	55.8665	55.5720	55.3657	55.1517
alpha	4.6467	4.6544	4.6620	4.6980	4.7048	4.7368	4.7368	4.7428	4.7244	4.7048	4.6910	4.6768
util living area	0.9922	0.9838	0.9659	0.9230	0.8311	0.6680	0.5006	0.5343	0.7546	0.9329	0.9839	0.9939 (86)
MIT	19.8074	19.9950	20.2533	20.5570	20.8051	20.9495	20.9895	20.9857	20.9077	20.5939	20.1423	19.7706 (87)
Th 2	19.8648	19.8669	19.8690	19.8787	19.8805	19.8890	19.8890	19.8906	19.8857	19.8805	19.8768	19.8730 (88)
util rest of house	0.9897	0.9786	0.9547	0.8971	0.7753	0.5715	0.3797	0.4129	0.6669	0.9048	0.9778	0.9919 (89)
MIT 2	18.3092	18.5816	18.9521	19.3802	19.6978	19.8570	19.8854	19.8852	19.8188	19.4397	18.8039	18.2616 (90)
Living area fraction									fLA = Living area / (4) =			0.5024 (91)
MIT	19.0618	19.2916	19.6058	19.9714	20.2541	20.4059	20.4401	20.4380	20.3658	20.0195	19.4763	19.0196 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0618	19.2916	19.6058	19.9714	20.2541	20.4059	20.4401	20.4380	20.3658	20.0195	19.4763	19.0196 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	415.9631	476.9658	511.4569	512.3071	462.5660	347.3064	238.8196	249.6388	360.9378	425.4711	409.3454	394.9255 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	952.3927	926.5534	842.0262	704.3965	543.2361	365.5478	241.7772	253.8347	395.8215	598.1974	788.8986	948.3119 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	399.1036	302.1228	245.9436	138.3044	60.0185	0.0000	0.0000	0.0000	0.0000	128.5084	273.2783	411.7195 (98)
Space heating												1958.9991 (98)
Space heating per m2										(98) / (4) =		38.5478 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2095.1862 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	399.1036	302.1228	245.9436	138.3044	60.0185	0.0000	0.0000	0.0000	0.0000	128.5084	273.2783	411.7195	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	426.8488	323.1260	263.0412	147.9192	64.1909	0.0000	0.0000	0.0000	0.0000	137.4421	292.2763	440.3417	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7993	148.9665	156.8863	141.2465	138.8576	124.7075	120.3706	131.2535	130.7616	146.4347	154.0748	164.9434	(64)
Efficiency of water heater (217)m	87.0314	86.6626	86.0086	84.7578	82.7527	79.8000	79.8000	79.8000	79.8000	84.4678	86.3268	79.8000	(216)
Fuel for water heating, kWh/month	193.9522	171.8925	182.4077	166.6472	167.7983	156.2751	150.8403	164.4781	163.8616	173.3615	178.4786	189.2479	(219)
Water heating fuel used												2059.2411	(219)
Annual totals kWh/year													
Space heating fuel - main system												2095.1862	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.5302	(232)
Total delivered energy for all uses												4472.9575	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2095.1862	0.2160	452.5602 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2059.2411	0.2160	444.7961 (264)
Space and water heating			897.3563 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.5302	0.5190	126.3922 (268)
Total CO2, kg/m2/year			1062.6735 (272)
Emissions per m2 for space and water heating			17.6575 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4871 (272b)
Emissions per m2 for pumps and fans			0.7659 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.6575 * 1.55) + 2.4871 + 0.7659, rounded to 2 d.p.			30.6200 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010518			Issued on Date	29/04/2022
Assessment Reference	048	Prop Type Ref			
Property					
SAP Rating	82 B	DER	16.21	TER	27.31
Environmental	88 B	% DER<TER	40.65		
CO ₂ Emissions (t/year)	0.92	DFEE	44.80	TFEE	51.93
General Requirements Compliance	Pass	% DFEE<TFEE	13.72		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Ground-floor flat, total floor area 70 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 27.31 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.21 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)51.9 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)44.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing South East:	6.24 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Windows facing South West:	5.10 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	221.90 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	69.6200 (1b)	x 2.8000 (2b)	= 194.9360 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 194.9360 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							2	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1275 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			13.5500	1.1450	15.5153		(27)					
Ground Floor			69.6200	0.1000	6.9620		(28a)					
External Wall	51.5200	13.5500	37.9700	0.1500	5.6955		(29a)					
Corridor	7.6200	1.8900	5.7300	0.2500	1.4325		(29a)					
Unheated	19.4000		19.4000	0.2000	3.8800		(29a)					
Total net area of external elements Aum(A, m2)			148.1600				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		35.3753		(33)					
Party Wall 1			20.5800	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.8220 (36)					
Total fabric heat loss							(33) + (36) = 47.1973 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 18.0161	Feb 17.8111	Mar 17.6060	Apr 16.5808	May 16.3757	Jun 15.3505	Jul 15.3505	Aug 15.1454	Sep 15.7606	Oct 16.3757	Nov 16.7858	Dec 17.1959 (38)
Heat transfer coeff	65.2134	65.0083	64.8033	63.7780	63.5730	62.5477	62.5477	62.3427	62.9578	63.5730	63.9831	64.3932 (39)
Average = Sum(39)m / 12 =	63.7268 (39)											
HLP	Jan 0.9367	Feb 0.9338	Mar 0.9308	Apr 0.9161	May 0.9131	Jun 0.8984	Jul 0.8984	Aug 0.8955	Sep 0.9043	Oct 0.9131	Nov 0.9190	Dec 0.9249 (40)
HLP (average)	0.9154 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2369 (42)
Average daily hot water use (litres/day)												87.3255 (43)
Daily hot water use	Jan 96.0581	Feb 92.5651	Mar 89.0720	Apr 85.5790	May 82.0860	Jun 78.5930	Jul 78.5930	Aug 82.0860	Sep 85.5790	Oct 89.0720	Nov 92.5651	Dec 96.0581 (44)
Energy conte	142.4513	124.5889	128.5645	112.0857	107.5489	92.8065	85.9989	98.6850	99.8636	116.3814	127.0394	137.9565 (45)
Energy content (annual)												Total = Sum(45)m = 1373.9704 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	21.3677	18.6883	19.2847	16.8129	16.1323	13.9210	12.8998	14.8027	14.9795	17.4572	19.0559	20.6935 (46)
Water storage loss:												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
197.7281	174.5163	183.8413	165.5794	162.8257	146.3002	141.2757	153.9618	153.3573	171.6582	180.5330	193.2333	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h												
197.7281	174.5163	183.8413	165.5794	162.8257	146.3002	141.2757	153.9618	153.3573	171.6582	180.5330	193.2333	(64)
Heat gains from water heating, kWh/month												
91.5865	81.3677	86.9692	80.0634	79.9814	73.6531	72.8161	77.0342	75.9996	82.9182	85.0355	90.0920	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
111.8432	111.8432	111.8432	111.8432	111.8432	111.8432	111.8432	111.8432	111.8432	111.8432	111.8432	111.8432	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
17.5108	15.5530	12.6485	9.5757	7.1580	6.0431	6.5297	8.4876	11.3921	14.4648	16.8826	17.9975	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
196.4085	198.4467	193.3107	182.3768	168.5748	155.6028	146.9368	144.8987	150.0346	160.9685	174.7705	187.7425	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.1843	34.1843	34.1843	34.1843	34.1843	34.1843	34.1843	34.1843	34.1843	34.1843	34.1843	34.1843	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-89.4746	-89.4746	-89.4746	-89.4746	-89.4746	-89.4746	-89.4746	-89.4746	-89.4746	-89.4746	-89.4746	-89.4746	(71)
Water heating gains (Table 5)												
123.1002	121.0829	116.8940	111.1992	107.5019	102.2960	97.8711	103.5406	105.5550	111.4493	118.1049	121.0914	(72)
Total internal gains												
393.5725	391.6355	379.4062	359.7047	339.7877	320.4949	307.8905	313.4798	323.5346	343.4355	366.3110	383.3843	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Southeast				6.2400	36.7938	0.4000	0.8000	0.7700	50.9147 (77)			
South				2.2100	46.7521	0.4000	0.8000	0.7700	22.9127 (78)			
Southwest				5.1000	36.7938	0.4000	0.8000	0.7700	41.6129 (79)			
Solar gains	115.4403	195.1338	263.4475	321.2220	355.5803	351.2973	339.3899	313.9245	283.4333	214.6656	137.9861	98.9830 (83)
Total gains	509.0128	586.7694	642.8536	680.9267	695.3680	671.7921	647.2804	627.4044	606.9680	558.1011	504.2971	482.3673 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	74.1370	74.3708	74.6061	75.8054	76.0499	77.2965	77.2965	77.5507	76.7930	75.5625	75.0813		
alpha	5.9425	5.9581	5.9737	6.0537	6.0700	6.1531	6.1531	6.1700	6.1195	6.0700	6.0375		
util living area	0.9942	0.9858	0.9648	0.9060	0.7805	0.5857	0.4239	0.4551	0.6868	0.9202	0.9856	0.9956	(86)
MIT	20.1817	20.3425	20.5512	20.7819	20.9317	20.9903	20.9988	20.9982	20.9752	20.7919	20.4475	20.1539	(87)
Th 2	20.1364	20.1389	20.1414	20.1538	20.1563	20.1688	20.1688	20.1714	20.1638	20.1563	20.1514	20.1464	(88)
util rest of house	0.9924	0.9815	0.9544	0.8798	0.7292	0.5141	0.3445	0.3742	0.6148	0.8923	0.9806	0.9943	(89)
MIT 2	19.0518	19.2859	19.5847	19.9089	20.0933	20.1627	20.1684	20.1706	20.1460	19.9301	19.4489	19.0190	(90)
Living area fraction									fLA = Living area / (4) =			0.4122	(91)
MIT	19.5176	19.7215	19.9831	20.2688	20.4389	20.5039	20.5107	20.5118	20.4878	20.2854	19.8606	19.4868	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5176	19.7215	19.9831	20.2688	20.4389	20.5039	20.5107	20.5118	20.4878	20.2854	19.8606	19.4868	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9907	0.9790	0.9521	0.8837	0.7472	0.5434	0.3773	0.4076	0.6436	0.8971	0.9784	0.9929	(94)
Useful gains	504.2756	574.4288	612.0683	601.7460	519.6085	365.0290	244.2261	255.7343	390.6177	500.6571	493.4161	478.9513	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	992.3920	963.5184	873.7520	725.0792	555.5588	369.2733	244.6083	256.3410	402.1643	615.7291	816.4626	984.3660	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	363.1586	261.4682	194.6926	88.7999	26.7470	0.0000	0.0000	0.0000	0.0000	85.6136	232.5935	376.0285	(98)
Space heating												1629.1020	(98)
Space heating per m2												23.3999	(99)
										(98) / (4) =			

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1629.1020 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1826.2234 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	96.1170 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2024.8102 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2269.8123 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	119.4638 (310b)
Electricity used for heat distribution	43.1162 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	187.2848 (330a)
Total electricity for the above, kWh/year	187.2848 (331)
Electricity for lighting (calculated in Appendix L)	309.2466 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	4808.1478 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1638.4142	0.5190	850.3370 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	217.7584	0.5190	113.0166 (368)
Electrical energy for heat distribution	43.1162	0.5190	22.3773 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			985.7309 (373)
Space and water heating			985.7309 (376)
Pumps and fans	187.2848	0.5190	97.2008 (378)
Energy for lighting	309.2466	0.5190	160.4990 (379)
Energy saving/generation technologies			
PV Unit	-221.9000	0.5190	-115.1661 (380)
Total CO2, kg/year			1128.2646 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			16.2100 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER	16.2100 ZC1
Total Floor Area	TFA 69.6200
Assumed number of occupants	N 2.2369
CO2 emission factor in Table 12 for electricity displaced from grid	EF 0.5190
CO2 emissions from appliances, equation (L14)	16.7175 ZC2
CO2 emissions from cooking, equation (L16)	2.4804 ZC3
Total CO2 emissions	35.4079 ZC4
Residual CO2 emissions offset from biofuel CHP	0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year	0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000 ZC7
Net CO2 emissions	35.4079 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	69.6200 (1b)	x 2.8000 (2b)	= 194.9360 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	69.6200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 194.9360 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) = 0.1026 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3526 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.2997 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3821	0.3746	0.3671	0.3297	0.3222	0.2847	0.2847	0.2772	0.2997	0.3222	0.3372	0.3522 (22b)
Effective ac	0.5730	0.5702	0.5674	0.5543	0.5519	0.5405	0.5405	0.5384	0.5449	0.5519	0.5568	0.5620 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			13.5500	1.3258	17.9640			(27)					
Ground Floor			69.6200	0.1300	9.0506			(28a)					
External Wall	51.5200	13.5500	37.9700	0.1800	6.8346			(29a)					
Corridor	7.6200	1.8900	5.7300	0.1800	1.0314			(29a)					
Unheated	19.4000		19.4000	0.1800	3.4920			(29a)					
Total net area of external elements Aum(A, m2)			148.1600					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.2626			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								9.9685 (36)					
Total fabric heat loss						(33) + (36) =		50.2311 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 36.8611	Feb 36.6788	Mar 36.5000	Apr 35.6603	May 35.5032	Jun 34.7719	Jul 34.7719	Aug 34.6365	Sep 35.0536	Oct 35.5032	Nov 35.8210	Dec 36.1533	(38)
Heat transfer coeff	87.0923	86.9099	86.7311	85.8914	85.7344	85.0030	85.0030	84.8676	85.2847	85.7344	86.0522	86.3844	(39)
Average = Sum(39)m / 12 =												85.8907	(39)
HLP	Jan 1.2510	Feb 1.2483	Mar 1.2458	Apr 1.2337	May 1.2315	Jun 1.2210	Jul 1.2210	Aug 1.2190	Sep 1.2250	Oct 1.2315	Nov 1.2360	Dec 1.2408	(40)
HLP (average)												1.2337	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2369 (42)
Average daily hot water use (litres/day)												87.3255 (43)
Daily hot water use	96.0581	92.5651	89.0720	85.5790	82.0860	78.5930	78.5930	82.0860	85.5790	89.0720	92.5651	96.0581 (44)
Energy conte	142.4513	124.5889	128.5645	112.0857	107.5489	92.8065	85.9989	98.6850	99.8636	116.3814	127.0394	137.9565 (45)
Energy content (annual)										Total = Sum(45)m =		1373.9704 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.3677	18.6883	19.2847	16.8129	16.1323	13.9210	12.8998	14.8027	14.9795	17.4572	19.0559	20.6935 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

Enter (49) or (54) in (55)											0.7527 (55)	
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (58)
Total heat required for water heating calculated for each month	189.0462	166.6746	175.1594	157.1775	154.1438	137.8983	132.5938	145.2799	144.9554	162.9763	172.1312	184.5514 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input	(sum of months) =	Sum(63)m =		0.0000 (63)
Output from w/h	189.0462	166.6746	175.1594	157.1775	154.1438	137.8983	132.5938	145.2799	144.9554	162.9763	172.1312	184.5514 (64)
								Total per year (kWh/year) =	Sum(64)m =			1922.5878 (64)
Heat gains from water heating, kWh/month	84.6410	75.0944	80.0236	73.3420	73.0359	66.9316	65.8705	70.0887	69.2781	75.9727	78.3141	83.1465 (65)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												2794.0229 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	544.7639	404.5482	320.2299	171.2393	68.6082	0.0000	0.0000	0.0000	0.0000	167.7519	371.5944	563.6756 (98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000 (210)
Space heating fuel (main heating system)	582.6352	432.6718	342.4919	183.1436	73.3777	0.0000	0.0000	0.0000	0.0000	179.4138	397.4272	602.8616 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	189.0462	166.6746	175.1594	157.1775	154.1438	137.8983	132.5938	145.2799	144.9554	162.9763	172.1312	184.5514 (64)
Efficiency of water heater (217)m	87.4782	87.0926	86.4036	85.0426	82.8158	79.8000	79.8000	79.8000	79.8000	84.8909	86.8149	79.8000 (216)
Fuel for water heating, kWh/month	216.1067	191.3763	202.7223	184.8220	186.1285	172.8049	166.1576	182.0550	181.6484	191.9833	198.2739	210.6685 (219)
Water heating fuel used												2284.7474 (219)
Annual totals kWh/year												
Space heating fuel - main system												2794.0229 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												312.3672 (232)
Total delivered energy for all uses												5466.1375 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2794.0229	0.2160	603.5089 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2284.7474	0.2160	493.5054 (264)
Space and water heating			1097.0144 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	312.3672	0.5190	162.1186 (268)
Total CO2, kg/m2/year			1298.0580 (272)
Emissions per m2 for space and water heating			15.7572 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3286 (272b)
Emissions per m2 for pumps and fans			0.5591 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.7572 * 1.55) + 2.3286 + 0.5591, rounded to 2 d.p.			27.3100 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010519			Issued on Date	29/04/2022
Assessment Reference	049	Prop Type Ref			
Property					
SAP Rating	82 B	DER	17.63	TER	29.29
Environmental	87 B	% DER<TER	39.81		
CO ₂ Emissions (t/year)	1.03	DFEE	50.85	TFEE	59.48
General Requirements Compliance	Pass	% DFEE<TFEE	14.51		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 29.29 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 17.63 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)59.5 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)50.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.61	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing West:	5.93 m ² , No overhang
Windows facing North West:	7.10 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Exposed floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	221.90 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					0.0000 / (5) = 0.0000 (8)
Measured/design AP50					Yes
Infiltration rate					3.0000
Number of sides sheltered					0.1500 (18)
					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			13.0300	1.1450	14.9198		(27)
Exposed			72.7700	0.1000	7.2770		(28b)
External Wall	35.0800	13.0300	22.0500	0.1500	3.3075		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Core	18.2300		18.2300	0.2500	4.5575		(29a)
Total net area of external elements Aum(A, m ²)			143.5800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.8543		(33)
Party Wall 1			18.3000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.4276 (36)
Total fabric heat loss						(33) + (36) =	52.2819 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	17.0688	16.8774	16.6860	15.7292	15.5379	14.5811	14.5811	14.3897	14.9638	15.5379	15.9206	16.3033 (38)
Heat transfer coeff	69.3507	69.1594	68.9680	68.0112	67.8198	66.8630	66.8630	66.6716	67.2457	67.8198	68.2025	68.5853 (39)
Average = Sum(39)m / 12 =												67.9633 (39)
HLP	0.9530	0.9504	0.9478	0.9346	0.9320	0.9188	0.9188	0.9162	0.9241	0.9320	0.9372	0.9425 (40)
HLP (average)												0.9339 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)												Total = Sum(45)m = 1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)
Water storage loss:												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(64)
Total per year (kWh/year) = Sum(64)m =												2052.6825 (64)
Heat gains from water heating, kWh/month												
92.5474	82.2081	87.8363	80.8195	80.7069	74.2791	73.3961	77.6998	76.6732	83.7032	85.8924	91.0225	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
18.2451	16.2051	13.1789	9.9773	7.4581	6.2965	6.8035	8.8435	11.8697	15.0713	17.5905	18.7521	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	(71)
Water heating gains (Table 5)												
124.3916	122.3335	118.0596	112.2492	108.4770	103.1654	98.6507	104.4353	106.4905	112.5044	119.2950	122.3421	(72)
Total internal gains												
403.9823	401.9977	389.3716	369.0214	348.4174	328.4923	315.4981	321.2091	331.6165	352.1703	375.7927	393.4532	(73)

6. Solar gains

[Jan]			Area	Solar flux	g	FF	Access	Gains				
			m2	Table 6a	Specific data	Specific data	factor	W				
				W/m2	or Table 6b	or Table 6c	Table 6d					
West			5.9300	19.6403	0.4000	0.8000	0.7700	25.8277 (80)				
Northwest			7.1000	11.2829	0.4000	0.8000	0.7700	17.7649 (81)				
Solar gains	43.5926	86.6855	148.3572	228.3479	292.5450	305.5740	288.3795	238.8530	176.1598	104.1431	54.5570	35.7472 (83)
Total gains	447.5749	488.6831	537.7288	597.3693	640.9623	634.0663	603.8776	560.0621	507.7763	456.3135	430.3497	429.2004 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.8683	73.0700	73.2727	74.3035	74.5132	75.5795	75.5795	75.7964	75.1493	74.5132	74.0951	73.6816	
alpha	5.8579	5.8713	5.8848	5.9536	5.9675	6.0386	6.0386	6.0531	6.0100	5.9675	5.9397	5.9121	
util living area	0.9977	0.9955	0.9878	0.9544	0.8495	0.6531	0.4839	0.5410	0.8160	0.9724	0.9950	0.9982 (86)	
MIT	20.0474	20.1603	20.3718	20.6604	20.8841	20.9814	20.9973	20.9950	20.9331	20.6484	20.3021	20.0292 (87)	
Th 2	20.1227	20.1249	20.1271	20.1382	20.1404	20.1515	20.1515	20.1538	20.1471	20.1404	20.1360	20.1315 (88)	
util rest of house	0.9969	0.9941	0.9836	0.9386	0.8039	0.5756	0.3924	0.4450	0.7476	0.9598	0.9930	0.9976 (89)	
MIT 2	18.8461	19.0124	19.3207	19.7375	20.0279	20.1393	20.1505	20.1517	20.0938	19.7289	19.2280	18.8261 (90)	
Living area fraction									fLA = Living area / (4) =				0.3848 (91)
MIT	19.3083	19.4541	19.7251	20.0926	20.3573	20.4633	20.4763	20.4762	20.4168	20.0827	19.6413	19.2890 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.3083	19.4541	19.7251	20.0926	20.3573	20.4633	20.4763	20.4762	20.4168	20.0827	19.6413	19.2890 (93)	

8. Space heating requirement

Utilisation	0.9959	0.9926	0.9812	0.9376	0.8164	0.6049	0.4277	0.4821	0.7710	0.9587	0.9915	0.9968 (94)
Useful gains	445.7508	485.0441	527.6147	560.0879	523.2527	383.5432	258.2869	269.9971	391.5001	437.4883	426.7034	427.8161 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
1040.8372	1006.5493	912.1096	761.2231	587.1386	392.0375	259.1844	271.7652	424.7764	643.1149	855.3456	1034.8836	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
442.7443	350.4514	286.0643	144.8174	47.5311	0.0000	0.0000	0.0000	0.0000	152.9862	308.6224	451.6582	(98)
Space heating												2184.8753 (98)
Space heating per m2												(98) / (4) = 30.0244 (99)

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Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump	0.9500	(303a)
Fraction of heat from community Boilers	0.0500	(303b)
Fraction of total space heat from community Heat pump	0.9500	(304a)
Fraction of total space heat from community Boilers	0.0500	(304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.1800	(306)
Space heating:		
Annual space heating requirement	2184.8753	(98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	2449.2452	(307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	128.9076	(307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	2052.6825	(64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2301.0570	(310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	121.1083	(310b)
Electricity used for heat distribution	50.0032	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)		
mechanical ventilation fans (SFP = 0.7625)	169.2357	(330a)
Total electricity for the above, kWh/year	169.2357	(331)
Electricity for lighting (calculated in Appendix L)	322.2135	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
Total delivered energy for all uses	5491.7673	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			250.0000	(367a)
Space heating from Heat pump	1900.1209	0.5190	986.1627	(367)
Efficiency of heat source Boilers			99.0000	(367b)
Space heating from Boilers	252.5413	0.5190	131.0689	(368)
Electrical energy for heat distribution	50.0032	0.5190	25.9517	(372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1143.1833	(373)
Space and water heating			1143.1833	(376)
Pumps and fans	169.2357	0.5190	87.8333	(378)
Energy for lighting	322.2135	0.5190	167.2288	(379)
Energy saving/generation technologies				
PV Unit	-221.9000	0.5190	-115.1661	(380)
Total CO2, kg/year			1283.0794	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			17.6300	(384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			17.6300	ZC1
Total Floor Area		TFA	72.7700	
Assumed number of occupants		N	2.3115	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.5855	ZC2
CO2 emissions from cooking, equation (L16)			2.3976	ZC3
Total CO2 emissions			36.6131	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			36.6131	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1649 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4149 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3527 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4497	0.4408	0.4320	0.3879	0.3791	0.3350	0.3350	0.3262	0.3527	0.3791	0.3968	0.4144 (22b)
Effective ac	0.6011	0.5972	0.5933	0.5752	0.5719	0.5561	0.5561	0.5532	0.5622	0.5719	0.5787	0.5859 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			13.0300	1.3258	17.2746			(27)					
Exposed			72.7700	0.1300	9.4601			(28b)					
External Wall	35.0800	13.0300	22.0500	0.1800	3.9690			(29a)					
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098			(29a)					
Core	18.2300		18.2300	0.1800	3.2814			(29a)					
Total net area of external elements Aum(A, m2)			143.5800					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.6849			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								15.1850 (36)					
Total fabric heat loss						(33) + (36) =	53.8699	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.0868	35.8511	35.6201	34.5351	34.3321	33.3870	33.3870	33.2120	33.7511	34.3321	34.7427	35.1721	(38)
Heat transfer coeff	89.9567	89.7210	89.4900	88.4050	88.2020	87.2570	87.2570	87.0820	87.6210	88.2020	88.6127	89.0420	(39)
Average = Sum(39)m / 12 =												88.4040	(39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2362	1.2329	1.2298	1.2149	1.2121	1.1991	1.1991	1.1967	1.2041	1.2121	1.2177	1.2236	(40)
HLP (average)												1.2148	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)										Total = Sum(45)m =		1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												
21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)	
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (64)
Heat gains from water heating, kWh/month	85.6018	75.9347	80.8908	74.0980	73.7613	67.5576	66.4506	70.7543	69.9517	76.7577	79.1709	84.0770 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5611	16.4858	13.4072	10.1501	7.5873	6.4055	6.9214	8.9967	12.0753	15.3324	17.8952	19.0770	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	(71)
Water heating gains (Table 5)	115.0562	112.9981	108.7242	102.9139	99.1416	93.8300	89.3153	95.0999	97.1551	103.1690	109.9597	113.0067	(72)
Total internal gains	397.9629	395.9430	383.2645	362.8588	342.2112	322.2660	309.2806	315.0269	325.4868	346.0960	369.7620	387.4427	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
West					5.9300	19.6403	0.6300	0.7000			0.7700			35.5938 (80)
Northwest					7.1000	11.2829	0.6300	0.7000			0.7700			24.4823 (81)
Solar gains	60.0761	119.4634	204.4548	314.6920	403.1636	421.1192	397.4230	329.1693	242.7702	143.5223	75.1863			49.2641 (83)
Total gains	458.0390	515.4064	587.7193	677.5508	745.3747	743.3852	706.7036	644.1963	568.2570	489.6183	444.9483			436.7067 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	56.1767	56.3243	56.4697	57.1627	57.2943	57.9148	57.9148	58.0312	57.6742	57.2943	57.0288	56.7538
alpha	4.7451	4.7550	4.7646	4.8108	4.8196	4.8610	4.8610	4.8687	4.8449	4.8196	4.8019	4.7836
util living area	0.9975	0.9952	0.9873	0.9562	0.8653	0.6940	0.5301	0.5970	0.8535	0.9768	0.9952	0.9980 (86)
MIT	19.6717	19.8156	20.0875	20.4619	20.7763	20.9456	20.9881	20.9796	20.8472	20.4397	19.9942	19.6500 (87)
Th 2	19.8912	19.8937	19.8963	19.9081	19.9104	19.9207	19.9207	19.9227	19.9167	19.9104	19.9059	19.9012 (88)
util rest of house	0.9967	0.9935	0.9826	0.9394	0.8160	0.5991	0.4068	0.4694	0.7809	0.9649	0.9932	0.9974 (89)
MIT 2	18.1306	18.3423	18.7386	19.2791	19.6936	19.8854	19.9165	19.9144	19.7934	19.2585	18.6122	18.1058 (90)
Living area fraction	18.7236	18.9092	19.2576	19.7342	20.1102	20.2933	20.3288	20.3243	20.1989	19.7130	19.1440	18.7000 (91)
MIT	18.7236	18.9092	19.2576	19.7342	20.1102	20.2933	20.3288	20.3243	20.1989	19.7130	19.1440	18.7000 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7236	18.9092	19.2576	19.7342	20.1102	20.2933	20.3288	20.3243	20.1989	19.7130	19.1440	18.7000 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	455.9151	510.9945	575.3980	634.2636	615.8056	471.1357	321.2783	334.2255	456.0159	471.0286	441.0377	435.0859	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1297.4966	1256.9165	1141.6806	957.8011	741.7970	496.7810	325.3670	341.7325	534.3878	803.7819	1067.2466	1291.1091	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	626.1367	501.2596	421.3142	232.9470	93.7377	0.0000	0.0000	0.0000	0.0000	247.5684	450.8704	636.8813	(98)
Space heating												3210.7152	(98)
Space heating per m ²												44.1214	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3433.9200 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	626.1367	501.2596	421.3142	232.9470	93.7377	0.0000	0.0000	0.0000	0.0000	247.5684	450.8704	636.8813	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	669.6649	536.1065	450.6034	249.1412	100.2542	0.0000	0.0000	0.0000	0.0000	264.7791	482.2144	681.1564	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500	(64)
Efficiency of water heater (217)m	87.7398	87.5378	87.0370	85.8238	83.5008	79.8000	79.8000	79.8000	79.8000	85.8886	87.2334	87.8233	(216)
Fuel for water heating, kWh/month	218.7559	193.2901	204.2436	185.7890	187.2145	175.1642	168.3438	184.5636	184.1870	192.5020	200.2768	213.3260	(219)
Water heating fuel used												2307.6565	(219)
Annual totals kWh/year													
Space heating fuel - main system												3433.9200	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												327.7949	(232)
Total delivered energy for all uses												6144.3714	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3433.9200	0.2160	741.7267 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2307.6565	0.2160	498.4538 (264)
Space and water heating			1240.1805 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	327.7949	0.5190	170.1255 (268)
Total CO2, kg/m2/year			1449.2311 (272)
Emissions per m2 for space and water heating			17.0425 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3379 (272b)
Emissions per m2 for pumps and fans			0.5349 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.0425 * 1.55) + 2.3379 + 0.5349, rounded to 2 d.p.			29.2900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010520			Issued on Date	29/04/2022
Assessment Reference	050	Prop Type Ref			
Property					
SAP Rating	82 B	DER	18.03	TER	30.02
Environmental	87 B	% DER<TER	39.94		
CO ₂ Emissions (t/year)	1.05	DFEE	52.38	TFEE	61.68
General Requirements Compliance	Pass	% DFEE<TFEE	15.09		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 30.02 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 18.03 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 61.7 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 52.4 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room stats OK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.61	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing North:	5.88 m ² , No overhang
Windows facing North West:	7.10 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Exposed floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	221.90 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												75.6500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			12.9800	1.1450	14.8626		(27)
Exposed			72.7700	0.1000	7.2770		(28b)
External Wall	35.0800	12.9800	22.1000	0.1500	3.3150		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Core	18.2300		18.2300	0.2500	4.5575		(29a)
Total net area of external elements Aum(A, m2)			143.5800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		35.8046		(33)
Party Wall 1			18.3000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.4256 (36)
Total fabric heat loss							(33) + (36) = 52.2302 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	17.0688	16.8774	16.6860	15.7292	15.5379	14.5811	14.5811	14.3897	14.9638	15.5379	15.9206	16.3033 (38)
Heat transfer coeff	69.2990	69.1076	68.9162	67.9594	67.7681	66.8113	66.8113	66.6199	67.1940	67.7681	68.1508	68.5335 (39)
Average = Sum(39)m / 12 =												67.9116 (39)
HLP	0.9523	0.9497	0.9470	0.9339	0.9313	0.9181	0.9181	0.9155	0.9234	0.9313	0.9365	0.9418 (40)
HLP (average)												0.9332 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)												Total = Sum(45)m = 1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)
Water storage loss:											
Store volume											110.0000 (47)
b) If manufacturer declared loss factor is not known :											
Hot water storage loss factor from Table 2 (kWh/litre/day)											0.0152 (51)
Volume factor from Table 2a											1.0294 (52)
Temperature factor from Table 2b											0.6000 (53)
Enter (49) or (54) in (55)											1.0327 (55)
Total storage loss											
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage											
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month											
200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =											0.0000 (63)
Output from w/h											
200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319 (64)
Total per year (kWh/year) = Sum(64)m =											2052.6825 (64)
Heat gains from water heating, kWh/month											
92.5474	82.2081	87.8363	80.8195	80.7069	74.2791	73.3961	77.6998	76.6732	83.7032	85.8924	91.0225 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5											
18.2514	16.2107	13.1835	9.9807	7.4607	6.2986	6.8059	8.8466	11.8739	15.0766	17.5966	18.7587 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											
203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573 (69)
Pumps, fans											
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)											
-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581 (71)
Water heating gains (Table 5)											
124.3916	122.3335	118.0596	112.2492	108.4770	103.1654	98.6507	104.4353	106.4905	112.5044	119.2950	122.3421 (72)
Total internal gains											
403.9886	402.0033	389.3762	369.0248	348.4200	328.4945	315.5005	321.2122	331.6207	352.1755	375.7988	393.4597 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	g Specific data or Table 6c	FF Specific data or Table 6c	Access factor Table 6d			Gains W
North				5.8800	10.6334	0.4000		0.8000	0.7700			13.8654 (74)
Northwest				7.1000	11.2829	0.4000		0.8000	0.7700			17.7649 (81)

Solar gains	31.6303	62.6585	110.1764	179.3190	241.2494	257.6284	240.8129	191.6050	133.5227	75.7335	39.4577	26.0666 (83)
Total gains	435.6190	464.6619	499.5526	548.3439	589.6693	586.1229	556.3134	512.8172	465.1433	427.9090	415.2565	419.5263 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	72.9228	73.1247	73.3277	74.3601	74.5701	75.6380	75.6380	75.8553	75.2072	74.5701	74.1513	73.7372
alpha	5.8615	5.8750	5.8885	5.9573	5.9713	6.0425	6.0425	6.0570	6.0138	5.9713	5.9434	5.9158
util living area												
	0.9980	0.9965	0.9915	0.9683	0.8834	0.6966	0.5231	0.5867	0.8560	0.9794	0.9958	0.9984 (86)
MIT	20.0326	20.1299	20.3246	20.6086	20.8531	20.9740	20.9960	20.9924	20.9119	20.6160	20.2832	20.0174 (87)
Th 2	20.1233	20.1255	20.1277	20.1388	20.1410	20.1521	20.1521	20.1544	20.1477	20.1410	20.1366	20.1321 (88)
util rest of house												
	0.9973	0.9954	0.9885	0.9565	0.8432	0.6176	0.4252	0.4845	0.7936	0.9695	0.9942	0.9978 (89)
MIT 2	18.8250	18.9686	19.2535	19.6679	19.9937	20.1345	20.1506	20.1511	20.0743	19.6849	19.2012	18.8093 (90)
Living area fraction									fLA = Living area / (4) =			0.3848 (91)
MIT	19.2897	19.4155	19.6656	20.0299	20.3244	20.4575	20.4759	20.4748	20.3966	20.0431	19.6175	19.2741 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2897	19.4155	19.6656	20.0299	20.3244	20.4575	20.4759	20.4748	20.3966	20.0431	19.6175	19.2741 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9964	0.9941	0.9864	0.9547	0.8527	0.6472	0.4630	0.5240	0.8138	0.9681	0.9928	0.9971 (94)
Useful gains	434.0633	461.9354	492.7572	523.4959	502.8264	379.3220	257.5823	268.7215	378.5326	414.2641	412.2833	418.3185 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
	1038.7686	1003.1294	907.3265	756.3792	584.4581	391.3476	258.9514	271.4633	423.0920	639.9427	853.0788	1033.0843 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
	449.9007	363.6823	308.4395	167.6760	60.7340	0.0000	0.0000	0.0000	0.0000	167.9049	317.3728	457.3858 (98)
Space heating												2293.0961 (98)
Space heating per m2												31.5116 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump	0.9500	(303a)
Fraction of heat from community Boilers	0.0500	(303b)
Fraction of total space heat from community Heat pump	0.9500	(304a)
Fraction of total space heat from community Boilers	0.0500	(304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.1800	(306)
Space heating:		
Annual space heating requirement	2293.0961	(98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	2570.5607	(307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	135.2927	(307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	2052.6825	(64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2301.0570	(310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	121.1083	(310b)
Electricity used for heat distribution	51.2802	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)		
mechanical ventilation fans (SFP = 0.7625)	169.2357	(330a)
Total electricity for the above, kWh/year	169.2357	(331)
Electricity for lighting (calculated in Appendix L)	322.3254	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
Total delivered energy for all uses	5619.5798	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			250.0000	(367a)
Space heating from Heat pump	1948.6471	0.5190	1011.3478	(367)
Efficiency of heat source Boilers			99.0000	(367b)
Space heating from Boilers	258.9908	0.5190	134.4162	(368)
Electrical energy for heat distribution	51.2802	0.5190	26.6144	(372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1172.3785	(373)
Space and water heating			1172.3785	(376)
Pumps and fans	169.2357	0.5190	87.8333	(378)
Energy for lighting	322.3254	0.5190	167.2869	(379)
Energy saving/generation technologies				
PV Unit	-221.9000	0.5190	-115.1661	(380)
Total CO2, kg/year			1312.3326	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			18.0300	(384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			18.0300	ZC1
Total Floor Area		TFA	72.7700	
Assumed number of occupants		N	2.3115	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.5855	ZC2
CO2 emissions from cooking, equation (L16)			2.3976	ZC3
Total CO2 emissions			37.0131	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			37.0131	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1649 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4149 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3527 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4497	0.4408	0.4320	0.3879	0.3791	0.3350	0.3350	0.3262	0.3527	0.3791	0.3968	0.4144 (22b)
Effective ac	0.6011	0.5972	0.5933	0.5752	0.5719	0.5561	0.5561	0.5532	0.5622	0.5719	0.5787	0.5859 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			12.9800	1.3258	17.2083			(27)					
Exposed			72.7700	0.1300	9.4601			(28b)					
External Wall	35.0800	12.9800	22.1000	0.1800	3.9780			(29a)					
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098			(29a)					
Core	18.2300		18.2300	0.1800	3.2814			(29a)					
Total net area of external elements Aum(A, m2)			143.5800					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.6276			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								15.1830 (36)					
Total fabric heat loss						(33) + (36) =		53.8106 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 36.0868	Feb 35.8511	Mar 35.6201	Apr 34.5351	May 34.3321	Jun 33.3870	Jul 33.3870	Aug 33.2120	Sep 33.7511	Oct 34.3321	Nov 34.7427	Dec 35.1721	(38)
Heat transfer coeff	89.8974	89.6617	89.4307	88.3457	88.1427	87.1977	87.1977	87.0227	87.5617	88.1427	88.5534	88.9827	(39)
Average = Sum(39)m / 12 =												88.3447	(39)
HLP	Jan 1.2354	Feb 1.2321	Mar 1.2290	Apr 1.2140	May 1.2113	Jun 1.1983	Jul 1.1983	Aug 1.1959	Sep 1.2033	Oct 1.2113	Nov 1.2169	Dec 1.2228	(40)
HLP (average)												1.2140	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)										Total = Sum(45)m =		1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												
21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)	
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (64)
Heat gains from water heating, kWh/month	85.6018	75.9347	80.8908	74.0980	73.7613	67.5576	66.4506	70.7543	69.9517	76.7577	79.1709	84.0770 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5727	16.4961	13.4155	10.1564	7.5920	6.4095	6.9257	9.0023	12.0829	15.3420	17.9064	19.0889	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	(71)
Water heating gains (Table 5)	115.0562	112.9981	108.7242	102.9139	99.1416	93.8300	89.3153	95.0999	97.1551	103.1690	109.9597	113.0067	(72)
Total internal gains	397.9745	395.9533	383.2729	362.8651	342.2159	322.2700	309.2849	315.0325	325.4943	346.1056	369.7732	387.4546	(73)

6. Solar gains

[Jan]					Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
North					5.8800	10.6334	0.6300	0.7000			0.7700	19.1083
Northwest					7.1000	11.2829	0.6300	0.7000			0.7700	24.4823
Solar gains	43.5906	86.3513	151.8369	247.1241	332.4718	355.0441	331.8703	264.0557	184.0109	104.3702	54.3776	35.9231
Total gains	441.5651	482.3046	535.1098	609.9892	674.6877	677.3141	641.1552	579.0882	509.5053	450.4758	424.1508	423.3777

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	56.2138	56.3615	56.5071	57.2011	57.3329	57.9542	57.9542	58.0708	57.7133	57.3329	57.0670	56.7916
alpha	4.7476	4.7574	4.7671	4.8134	4.8222	4.8636	4.8636	4.8714	4.8476	4.8222	4.8045	4.7861
util living area	0.9979	0.9964	0.9913	0.9700	0.8980	0.7406	0.5776	0.6514	0.8913	0.9832	0.9961	0.9983 (86)
MIT	19.6521	19.7755	20.0251	20.3911	20.7270	20.9278	20.9829	20.9704	20.8082	20.3953	19.9692	19.6343 (87)
Th 2	19.8918	19.8944	19.8969	19.9088	19.9110	19.9214	19.9214	19.9233	19.9174	19.9110	19.9065	19.9018 (88)
util rest of house	0.9972	0.9951	0.9880	0.9577	0.8560	0.6466	0.4465	0.5179	0.8289	0.9742	0.9944	0.9977 (89)
MIT 2	18.1024	18.2844	18.6495	19.1831	19.6376	19.8726	19.9151	19.9108	19.7544	19.1972	18.5763	18.0833 (90)
Living area fraction	18.6987	18.8581	19.1788	19.6479	20.0568	20.2786	20.3260	20.3185	20.1599	19.6582	19.1123	18.6801 (92)
Temperature adjustment	18.6987	18.8581	19.1788	19.6479	20.0568	20.2786	20.3260	20.3185	20.1599	19.6582	19.1123	18.6801 (93)
adjusted MIT	18.6987	18.8581	19.1788	19.6479	20.0568	20.2786	20.3260	20.3185	20.1599	19.6582	19.1123	18.6801 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	439.7982	479.1159	527.1258	581.9274	581.8938	460.6378	318.9100	329.8776	430.7179	437.5887	421.0590	421.9939	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1294.4055	1251.5092	1133.8736	949.5328	736.5912	495.1600	324.8961	341.0002	530.6128	798.4137	1063.7290	1288.4776	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	635.8278	519.0482	451.4203	264.6759	115.0948	0.0000	0.0000	0.0000	0.0000	268.4538	462.7223	644.6638	(98)
Space heating												3361.9071	(98)
Space heating per m ²												46.1991	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3595.6226 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	635.8278	519.0482	451.4203	264.6759	115.0948	0.0000	0.0000	0.0000	0.0000	268.4538	462.7223	644.6638	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	680.0298	555.1318	482.8025	283.0758	123.0961	0.0000	0.0000	0.0000	0.0000	287.1163	494.8902	689.4800	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500	(64)
Efficiency of water heater (217)m	87.7711	87.6120	87.1967	86.1569	84.0120	79.8000	79.8000	79.8000	79.8000	86.0998	87.2920	87.8476	(216)
Fuel for water heating, kWh/month	218.6778	193.1266	203.8696	185.0709	186.0752	175.1642	168.3438	184.5636	184.1870	192.0297	200.1424	213.2670	(219)
Water heating fuel used												2304.5178	(219)
Annual totals kWh/year													
Space heating fuel - main system													3595.6226 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													75.0000 (231)
Electricity for lighting (calculated in Appendix L)													327.9999 (232)
Total delivered energy for all uses													6303.1402 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3595.6226	0.2160	776.6545 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2304.5178	0.2160	497.7758 (264)
Space and water heating			1274.4303 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	327.9999	0.5190	170.2319 (268)
Total CO2, kg/m2/year			1483.5872 (272)
Emissions per m2 for space and water heating			17.5131 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3393 (272b)
Emissions per m2 for pumps and fans			0.5349 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.5131 * 1.55) + 2.3393 + 0.5349, rounded to 2 d.p.			30.0200 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010521				Issued on Date	29/04/2022
Assessment Reference	051			Prop Type Ref		
Property						
SAP Rating	82 B	DER	16.62	TER	27.96	
Environmental	88 B	% DER<TER	40.56			
CO ₂ Emissions (t/year)	0.99	DFEE	47.14	TFEE	55.88	
General Requirements Compliance	Fail	% DFEE<TFEE	15.64			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 74 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 27.96 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.62 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)55.9 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)47.1 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.61	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing North:	1.97 m ² , No overhang
Windows facing North East:	9.35 m ² , No overhang
Windows facing East:	2.21 m ² , No overhang
Windows facing South East:	6.24 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Exposed floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	221.90 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					0.0000 / (5) = 0.0000 (8)
Measured/design AP50					Yes
Infiltration rate					3.0000
Number of sides sheltered					0.1500 (18)
					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			19.7700	1.1450	22.6374		(27)
Exposed			73.5200	0.1000	7.3520		(28b)
External Wall	49.6500	19.7700	29.8800	0.1500	4.4820		(29a)
Corridor	5.4000	1.8900	3.5100	0.2500	0.8775		(29a)
Total net area of external elements Aum(A, m ²)			128.5700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.2389		(33)
Party Wall 1			38.0500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.1586 (36)
Total fabric heat loss						(33) + (36) =	53.3975 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	17.2447	17.0514	16.8580	15.8913	15.6980	14.7313	14.7313	14.5380	15.1180	15.6980	16.0847	16.4714 (38)
Average = Sum(39)m / 12 =	70.6422	70.4489	70.2555	69.2889	69.0955	68.1288	68.1288	67.9355	68.5155	69.0955	69.4822	69.8689 (39)
												69.2405 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9609	0.9582	0.9556	0.9424	0.9398	0.9267	0.9267	0.9240	0.9319	0.9398	0.9451	0.9503 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy content (annual)	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1408.1991 (45)
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1944.9411 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	2180.2790 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	114.7515 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2059.0388 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2308.1825 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	121.4833 (310b)
Electricity used for heat distribution	47.2470 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	170.9800 (330a)
Total electricity for the above, kWh/year	170.9800 (331)
Electricity for lighting (calculated in Appendix L)	323.3395 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	5219.0158 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1795.3846	0.5190	931.8046 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	238.6210	0.5190	123.8443 (368)
Electrical energy for heat distribution	47.2470	0.5190	24.5212 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1080.1701 (373)
Space and water heating			1080.1701 (376)
Pumps and fans	170.9800	0.5190	88.7386 (378)
Energy for lighting	323.3395	0.5190	167.8132 (379)
Energy saving/generation technologies			
PV Unit	-221.9000	0.5190	-115.1661 (380)
Total CO2, kg/year			1221.5558 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			16.6200 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		16.6200 ZC1
Total Floor Area	TFA	73.5200
Assumed number of occupants	N	2.3285
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.5530 ZC2
CO2 emissions from cooking, equation (L16)		2.3787 ZC3
Total CO2 emissions		35.5517 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		35.5517 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1632 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4132 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3512 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4478	0.4390	0.4303	0.3864	0.3776	0.3337	0.3337	0.3249	0.3512	0.3776	0.3951	0.4127 (22b)
	0.6003	0.5964	0.5926	0.5746	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			16.4900	1.3258	21.8617		(27)
Exposed			73.5200	0.1300	9.5576		(28b)
External Wall	49.6500	16.4900	33.1600	0.1800	5.9688		(29a)
Corridor	5.4000	1.8900	3.5100	0.1800	0.6318		(29a)
Total net area of external elements Aum(A, m ²)			128.5700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.9099		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.7440 (36)
Total fabric heat loss						(33) + (36) =	54.6539 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.4091	36.1729	35.9414	34.8541	34.6506	33.7036	33.7036	33.5282	34.0684	34.6506	35.0622	35.4924 (38)
Heat transfer coeff	91.0630	90.8268	90.5954	89.5080	89.3046	88.3575	88.3575	88.1822	88.7223	89.3046	89.7161	90.1464 (39)
Average = Sum(39)m / 12 =												89.5070 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2386	1.2354	1.2323	1.2175	1.2147	1.2018	1.2018	1.1994	1.2068	1.2147	1.2203	1.2261 (40)
HLP (average)												1.2175 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy content (annual)	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1408.1991 (45)
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
Heat gains from water heating, kWh/month	85.8210	76.1264	81.0886	74.2704	73.9268	67.7004	66.5829	70.9061	70.1053	76.9367	79.3664	84.2892 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3070	16.2601	13.2236	10.0111	7.4834	6.3178	6.8266	8.8735	11.9100	15.1225	17.6502	18.8158	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	(71)
Water heating gains (Table 5)	115.3508	113.2833	108.9900	103.1533	99.3640	94.0283	89.4931	95.3039	97.3685	103.4096	110.2311	113.2919	(72)
Total internal gains	399.9539	397.9707	385.2706	364.7888	344.0400	323.9750	310.8872	316.6137	327.0851	347.7714	371.5522	389.3425	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W			
North				1.6400	10.6334	0.6300	0.7000	0.7700	5.3295 (74)			
Northeast				7.8000	11.2829	0.6300	0.7000	0.7700	26.8961 (75)			
East				1.8400	19.6403	0.6300	0.7000	0.7700	11.0443 (76)			
Southeast				5.2100	36.7938	0.6300	0.7000	0.7700	58.5847 (77)			
Solar gains	101.8546	186.3291	288.0641	410.8612	508.2861	525.4572	497.9438	422.2753	330.2245	214.9569	124.3588	85.6262 (83)
Total gains	501.8085	584.2998	673.3347	775.6500	852.3261	849.4322	808.8310	738.8890	657.3096	562.7283	495.9110	474.9687 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	56.0662	56.2120	56.3556	57.0402	57.1701	57.7829	57.7829	57.8978	57.5453	57.1701	56.9079	56.6363	
alpha	4.7377	4.7475	4.7570	4.8027	4.8113	4.8522	4.8522	4.8599	4.8364	4.8113	4.7939	4.7758	
util living area	0.9965	0.9923	0.9793	0.9333	0.8170	0.6317	0.4734	0.5351	0.7979	0.9626	0.9927	0.9973	(86)
MIT	19.7168	19.8899	20.1766	20.5468	20.8306	20.9634	20.9926	20.9871	20.8891	20.5113	20.0481	19.6887	(87)
Th 2	19.8892	19.8918	19.8943	19.9061	19.9083	19.9185	19.9185	19.9205	19.9146	19.9083	19.9038	19.8991	(88)
util rest of house	0.9953	0.9896	0.9720	0.9101	0.7602	0.5388	0.3608	0.4165	0.7157	0.9449	0.9898	0.9964	(89)
MIT 2	18.1950	18.4485	18.8639	19.3900	19.7509	19.8958	19.9160	19.9155	19.8304	19.3543	18.6885	18.1608	(90)
Living area fraction									fLA = Living area / (4) =			0.3678	(91)
MIT	18.7547	18.9786	19.3467	19.8154	20.1480	20.2885	20.3120	20.3096	20.2198	19.7798	19.1885	18.7228	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7547	18.9786	19.3467	19.8154	20.1480	20.2885	20.3120	20.3096	20.2198	19.7798	19.1885	18.7228	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9936	0.9867	0.9674	0.9078	0.7739	0.5719	0.4025	0.4604	0.7412	0.9422	0.9871	0.9950	(94)
Useful gains	498.5759	576.5100	651.3861	704.1493	659.5782	485.7510	325.5256	340.1792	487.2066	530.2076	489.5205	472.5739	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1316.2904	1278.7172	1163.8527	977.0197	754.4457	502.6191	327.9809	344.7571	542.9634	819.8004	1084.5373	1309.1752	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	608.3796	471.8833	381.2751	196.4666	70.5814	0.0000	0.0000	0.0000	0.0000	215.4570	428.4122	622.4314	(98)
Space heating												2994.8866	(98)
Space heating per m2												40.7357	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												3203.0873 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	608.3796	471.8833	381.2751	196.4666	70.5814	0.0000	0.0000	0.0000	0.0000	215.4570	428.4122	622.4314 (98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000 (210)
Space heating fuel (main heating system)	650.6734	504.6880	407.7809	210.1247	75.4882	0.0000	0.0000	0.0000	0.0000	230.4353	458.1948	665.7020 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
Efficiency of water heater (217)m	87.6733	87.3993	86.7910	85.3630	82.8400	79.8000	79.8000	79.8000	79.8000	85.5124	87.1085	79.8000 (216)
Fuel for water heating, kWh/month	219.6734	194.2560	205.5077	187.3994	189.3085	175.7022	168.8423	185.1357	184.7660	193.9783	201.2386	214.1826 (219)
Water heating fuel used												2319.9908 (219)
Annual totals kWh/year												
Space heating fuel - main system												3203.0873 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												323.3067 (232)
Total delivered energy for all uses												5921.3849 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3203.0873	0.2160	691.8669 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2319.9908	0.2160	501.1180 (264)
Space and water heating			1192.9849 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	323.3067	0.5190	167.7962 (268)
Total CO2, kg/m2/year			1399.7061 (272)
Emissions per m2 for space and water heating			16.2267 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.2823 (272b)
Emissions per m2 for pumps and fans			0.5294 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.2267 * 1.55) + 2.2823 + 0.5294, rounded to 2 d.p.			27.9600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010522			Issued on Date	29/04/2022
Assessment Reference	052	Prop Type Ref			
Property					
SAP Rating	82 B	DER	16.10	TER	28.67
Environmental	90 B	% DER<TER	43.84		
CO ₂ Emissions (t/year)	0.68	DFEE	40.28	TFEE	46.63
General Requirements Compliance	Pass	% DFEE<TFEE	13.62		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aecom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 28.67 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.10 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 46.6 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 40.3 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.15 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room stats OK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing South East:	3.69 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Exposed floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	221.90 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			5.9000	1.1450	6.7557		(27)
Exposed			50.7900	0.1000	5.0790		(28b)
External Wall	19.8500	5.9000	13.9500	0.1500	2.0925		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Total net area of external elements Aum(A, m ²)				88.1400			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.7197		(33)
Party Wall 1			37.0000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.4658 (36)
Total fabric heat loss							(33) + (36) = 30.1855 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	11.1341	11.0123	10.8905	10.2816	10.1599	9.5510	9.5510	9.4292	9.7945	10.1599	10.4034	10.6470 (38)
Heat transfer coeff	41.3196	41.1978	41.0761	40.4672	40.3454	39.7365	39.7365	39.6147	39.9801	40.3454	40.5889	40.8325 (39)
Average = Sum(39)m / 12 =												40.4367 (39)
HLP	0.8135	0.8111	0.8087	0.7968	0.7944	0.7824	0.7824	0.7800	0.7872	0.7944	0.7992	0.8039 (40)
HLP (average)												0.7962 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
	Solar input (sum of months) = Sum (63)m =											0.0000 (63)	
Output from w/h													
	177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(64)
	Total per year (kWh/year) = Sum (64)m =											1829.1942 (64)	
Heat gains from water heating, kWh/month													
	84.8430	75.4698	80.8830	74.7574	74.8902	69.2597	68.7450	72.3625	71.2721	77.4089	79.0216	83.5613	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.4453	12.8302	10.4342	7.8994	5.9049	4.9851	5.3866	7.0017	9.3977	11.9326	13.9271	14.8468 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	114.0363	112.3063	108.7138	103.8297	100.6589	96.1941	92.3992	97.2615	98.9891	104.0442	109.7522	112.3135 (72)
Total internal gains	326.4678	324.6718	314.7796	299.0502	283.3942	268.1500	258.1697	263.0980	271.1253	287.0258	305.2190	318.5597 (73)

[Jan				Area	Solar flux	g	FF	Access	Gains			
				m2	Table 6a	or Table 6b	Specific data	factor	W			
					W/m2		or Table 6c	Table 6d				
Southeast				3.6900	36.7938	0.4000	0.8000	0.7700	30.1082 (77)			
South				2.2100	46.7521	0.4000	0.8000	0.7700	22.9127 (78)			
Solar gains	53.0209	88.8105	117.9712	140.9699	153.6829	150.8599	146.1469	136.8299	125.9133	97.1556	63.2220	45.5650 (83)
Total gains	379.4887	413.4823	432.7508	440.0200	437.0771	419.0099	404.3165	399.9279	397.0386	384.1814	368.4410	364.1247 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	85.3610	85.6133	85.8671	87.1591	87.4222	88.7618	88.7618	89.0346	88.2211	87.4222	86.8976	86.3793
alpha	6.6907	6.7076	6.7245	6.8106	6.8281	6.9175	6.9175	6.9356	6.8814	6.8281	6.7932	6.7586
util living area	0.9917	0.9838	0.9651	0.9135	0.7970	0.5992	0.4317	0.4546	0.6765	0.9073	0.9801	0.9935 (86)
MIT	20.3821	20.4945	20.6492	20.8267	20.9469	20.9936	20.9994	20.9992	20.9856	20.8596	20.5988	20.3601 (87)
Th 2	20.2416	20.2437	20.2458	20.2561	20.2582	20.2686	20.2686	20.2707	20.2645	20.2582	20.2541	20.2499 (88)
util rest of house	0.9893	0.9791	0.9552	0.8901	0.7506	0.5342	0.3604	0.3831	0.6117	0.8784	0.9736	0.9915 (89)
MIT 2	19.4243	19.5877	19.8090	20.0596	20.2084	20.2645	20.2684	20.2704	20.2540	20.1070	19.7472	19.3992 (90)
Living area fraction	19.9055	20.0433	20.2311	20.4451	20.5794	20.6308	20.6357	20.6366	20.6216	20.4851	20.1751	19.8820 (91)
MIT	19.9055	20.0433	20.2311	20.4451	20.5794	20.6308	20.6357	20.6366	20.6216	20.4851	20.1751	19.8820 (92)
Temperature adjustment	19.9055	20.0433	20.2311	20.4451	20.5794	20.6308	20.6357	20.6366	20.6216	20.4851	20.1751	19.8820 (93)
adjusted MIT	19.9055	20.0433	20.2311	20.4451	20.5794	20.6308	20.6357	20.6366	20.6216	20.4851	20.1751	19.8820 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9879	0.9777	0.9550	0.8965	0.7715	0.5667	0.3962	0.4191	0.6437	0.8880	0.9728	0.9904 (94)
Useful gains	374.9123	404.2611	413.2754	394.4932	337.1911	237.4681	160.2034	167.5937	255.5918	341.1379	358.4143	360.6201 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	644.8145	623.8716	564.0209	467.1957	358.2444	239.6446	160.3648	167.8300	260.7344	398.8196	530.7051	640.3362 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.6446	0.3648	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	200.8072	147.5783	112.1546	52.3458	15.6636	0.0000	0.0000	0.0000	0.0000	42.9152	124.0494	208.1088 (98)
Space heating												903.6229 (98)
Space heating per m2												17.7914 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	903.6229 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1012.9612 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	53.3137 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2050.5266 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	107.9225 (310b)
Electricity used for heat distribution	32.2472 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	255.1086 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	3601.8239 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1225.3952	0.5190	635.9801 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	162.8649	0.5190	84.5269 (368)
Electrical energy for heat distribution	32.2472	0.5190	16.7363 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			737.2433 (373)
Space and water heating			737.2433 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	255.1086	0.5190	132.4013 (379)
Energy saving/generation technologies			
PV Unit	-221.9000	0.5190	-115.1661 (380)
Total CO2, kg/year			817.7920 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			16.1000 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		16.1000 ZC1
Total Floor Area	TFA	50.7900
Assumed number of occupants	N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.4175 ZC2
CO2 emissions from cooking, equation (L16)		3.1526 ZC3
Total CO2 emissions		36.6701 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		36.6701 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					20.0000 / (5) = 0.1575 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4075 (18)
					3 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			5.9000	1.3258	7.8220		(27)
Exposed			50.7900	0.1300	6.6027		(28b)
External Wall	19.8500	5.9000	13.9500	0.1800	2.5110		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Total net area of external elements Aum(A, m ²)			88.1400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.6355		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.7556 (36)
Total fabric heat loss						(33) + (36) =	31.3911 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	24.3480	24.2160	24.0867	23.4794	23.3658	22.8368	22.8368	22.7389	23.0406	23.3658	23.5957	23.8360 (38)
Heat transfer coeff	55.7390	55.6071	55.4778	54.8705	54.7569	54.2279	54.2279	54.1299	54.4316	54.7569	54.9867	55.2270 (39)
Average = Sum(39)m / 12 =												54.8699 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0974	1.0948	1.0923	1.0803	1.0781	1.0677	1.0677	1.0658	1.0717	1.0781	1.0826	1.0874 (40)
HLP (average)												1.0803 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy content (annual)	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1178.3544 (45)
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
Heat gains from water heating, kWh/month	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.8788	13.2152	10.7473	8.1364	6.0821	5.1347	5.5483	7.2119	9.6797	12.2907	14.3450	15.2923 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782 (72)
Total internal gains	320.5660	318.7215	308.7573	292.9518	277.2360	261.9642	251.9959	256.9727	265.0719	281.0485	299.3015	312.6698 (73)

6. Solar gains

[Jan]												Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Southeast												3.6900	36.7938	0.6300	0.7000	0.7700	41.4928
South												2.2100	46.7521	0.6300	0.7000	0.7700	31.5766 (77)
Solar gains	73.0694	122.3919	162.5791	194.2741	211.7943	207.9038	201.4086	188.5686	173.5243	133.8926	87.1279	62.7943	(83)				
Total gains	393.6354	441.1134	471.3364	487.2260	489.0303	469.8680	453.4046	445.5414	438.5962	414.9411	386.4294	375.4641	(84)				

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	63.2785	63.4286	63.5765	64.2802	64.4135	65.0419	65.0419	65.1596	64.7984	64.4135	64.1443	63.8651
alpha	5.2186	5.2286	5.2384	5.2853	5.2942	5.3361	5.3361	5.3440	5.3199	5.2942	5.2763	5.2577
util living area	0.9935	0.9873	0.9739	0.9395	0.8576	0.6937	0.5180	0.5476	0.7700	0.9412	0.9863	0.9949 (86)
MIT	19.9923	20.1412	20.3545	20.6138	20.8317	20.9604	20.9930	20.9906	20.9290	20.6648	20.2826	19.9633 (87)
Th 2	20.0029	20.0050	20.0071	20.0169	20.0188	20.0273	20.0273	20.0289	20.0240	20.0188	20.0150	20.0112 (88)
util rest of house	0.9914	0.9833	0.9654	0.9189	0.8098	0.6060	0.4078	0.4378	0.6910	0.9171	0.9812	0.9932 (89)
MIT 2	18.6767	18.8938	19.2015	19.5717	19.8555	20.0010	20.0247	20.0251	19.9707	19.6477	19.1075	18.6406 (90)
Living area fraction									fLA = Living area / (4) =			0.5025 (91)
MIT	19.3377	19.5206	19.7809	20.0954	20.3460	20.4831	20.5112	20.5102	20.4522	20.1588	19.6980	19.3052 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3377	19.5206	19.7809	20.0954	20.3460	20.4831	20.5112	20.5102	20.4522	20.1588	19.6980	19.3052 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9896	0.9809	0.9630	0.9208	0.8272	0.6488	0.4634	0.4932	0.7278	0.9211	0.9791	0.9917 (94)
Useful gains	389.5554	432.6763	453.9078	448.6194	404.5154	304.8304	210.1230	219.7273	319.2029	382.2031	378.3672	372.3386 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	838.1883	813.0088	736.7939	614.2945	473.4286	319.0265	212.0977	222.4846	345.7620	523.4075	692.7207	834.2151 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	333.7829	255.5834	210.4673	119.2861	51.2714	0.0000	0.0000	0.0000	0.0000	105.0561	226.3345	343.6362 (98)
Space heating												1645.4179 (98)
Space heating per m2										(98) / (4) =		32.3965 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1759.8052 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	333.7829	255.5834	210.4673	119.2861	51.2714	0.0000	0.0000	0.0000	0.0000	105.0561	226.3345	343.6362	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	356.9871	273.3513	225.0987	127.5787	54.8357	0.0000	0.0000	0.0000	0.0000	112.3595	242.0690	367.5253	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	86.6005	86.2424	85.5988	84.3675	82.4284	79.8000	79.8000	79.8000	79.8000	83.9465	85.8388	79.8000	(216)
Fuel for water heating, kWh/month	194.8776	172.6952	183.2447	167.3861	168.4270	156.2471	150.8144	164.4484	163.8315	174.4047	179.4575	190.1443	(219)
Water heating fuel used												2065.9786	(219)
Annual totals kWh/year													
Space heating fuel - main system												1759.8052	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												262.7644	(232)
Total delivered energy for all uses												4163.5482	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1759.8052	0.2160	380.1179 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2065.9786	0.2160	446.2514 (264)
Space and water heating			826.3693 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	262.7644	0.5190	136.3747 (268)
Total CO2, kg/m2/year			1001.6690 (272)
Emissions per m2 for space and water heating			16.2703 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.6851 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.2703 * 1.55) + 2.6851 + 0.7664, rounded to 2 d.p.			28.6700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010523	Issued on Date	29/04/2022
Assessment Reference	053	Prop Type Ref	
Property			
SAP Rating	82 B	DER	16.48
Environmental	90 B	TER	28.88
CO ₂ Emissions (t/year)	0.69	% DER<TER	42.93
General Requirements Compliance	Pass	DFEE	42.10
		TFEE	48.33
		% DFEE<TFEE	12.88
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 28.88 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.48 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 48.3 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 42.1 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room stats OK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing South East:	6.24 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Exposed floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	221.90 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)
Exposed			50.7900	0.1000	5.0790		(28b)
External Wall	23.2500	8.4500	14.8000	0.1500	2.2200		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Total net area of external elements Aum(A, m ²)					91.5400		(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 22.7671		(33)
Party Wall 1				33.3000	0.0000	0.0000	(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.2902 (36)
Total fabric heat loss							(33) + (36) = 34.0573 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	11.1341	11.0123	10.8905	10.2816	10.1599	9.5510	9.5510	9.4292	9.7945	10.1599	10.4034	10.6470 (38)
Average = Sum(39)m / 12 =	45.1914	45.0696	44.9478	44.3389	44.2171	43.6083	43.6083	43.4865	43.8518	44.2171	44.4607	44.7042 (39)
												44.3085 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8898	0.8874	0.8850	0.8730	0.8706	0.8586	0.8586	0.8562	0.8634	0.8706	0.8754	0.8802 (40)
Days in month												0.8724 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy content (annual)	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1178.3544 (45)
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)

Water storage loss:													
Store volume												110.0000 (47)	
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)	
Volume factor from Table 2a												1.0294 (52)	
Temperature factor from Table 2b												0.6000 (53)	
Enter (49) or (54) in (55)												1.0327 (55)	
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
												Solar input (sum of months) = Sum(63)m = 0.0000 (63)	
Output from w/h													
	177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(64)
												Total per year (kWh/year) = Sum(64)m = 1829.1942 (64)	
Heat gains from water heating, kWh/month													
	84.8430	75.4698	80.8830	74.7574	74.8902	69.2597	68.7450	72.3625	71.2721	77.4089	79.0216	83.5613	(65)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9865	0.9729	0.9434	0.8721	0.7347	0.5339	0.3723	0.3980	0.6205	0.8755	0.9699	0.9894 (94)
Useful gains	393.9534	435.9313	453.3478	435.6869	370.2708	259.2141	174.3588	182.4973	278.5490	369.9350	380.6260	376.9058 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	699.7088	678.5358	614.6891	510.3563	391.2264	261.5528	174.5582	182.8013	284.4753	434.9146	577.2047	695.2486 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	227.4820	163.0302	120.0379	53.7620	15.5909	0.0000	0.0000	0.0000	0.0000	48.3448	141.5367	236.8470 (98)
Space heating												1006.6315 (98)
Space heating per m2												19.8195 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1006.6315 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1128.4339 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	59.3913 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2050.5266 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	107.9225 (310b)
Electricity used for heat distribution	33.4627 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	238.1302 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	3706.3958 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1271.5842	0.5190	659.9522 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	169.0038	0.5190	87.7129 (368)
Electrical energy for heat distribution	33.4627	0.5190	17.3672 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			765.0323 (373)
Space and water heating			765.0323 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	238.1302	0.5190	123.5896 (379)
Energy saving/generation technologies			
PV Unit	-221.9000	0.5190	-115.1661 (380)
Total CO2, kg/year			836.7693 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			16.4800 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		16.4800 ZC1
Total Floor Area	TFA	50.7900
Assumed number of occupants	N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.4175 ZC2
CO2 emissions from cooking, equation (L16)		3.1526 ZC3
Total CO2 emissions		37.0501 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		37.0501 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 20.0000 / (5) = 0.1575 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4075 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)
Exposed			50.7900	0.1300	6.6027		(28b)
External Wall	23.2500	8.4500	14.8000	0.1800	2.6640		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Total net area of external elements Aum(A, m ²)			91.5400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1692		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.4442 (36)
Total fabric heat loss						(33) + (36) =	35.6134 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	24.3480	24.2160	24.0867	23.4794	23.3658	22.8368	22.8368	22.7389	23.0406	23.3658	23.5957	23.8360 (38)
Heat transfer coeff	59.9613	59.8294	59.7001	59.0928	58.9791	58.4502	58.4502	58.3522	58.6539	58.9791	59.2090	59.4493 (39)
Average = Sum(39)m / 12 =												59.0922 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1806	1.1780	1.1754	1.1635	1.1612	1.1508	1.1508	1.1489	1.1548	1.1612	1.1658	1.1705 (40)
HLP (average)												1.1635 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
Heat gains from water heating, kWh/month	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415	(73)

6. Solar gains

[Jan]		Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W					
Southeast		6.2400	36.7938	0.6300	0.7000	0.7700	70.1668 (77)					
South		2.2100	46.7521	0.6300	0.7000	0.7700	31.5766 (78)					
Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains	421.2115	488.9806	537.3716	569.4289	581.3281	561.5651	541.7662	526.3621	510.2428	468.0154	419.7157	398.8747 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.8227	58.9524	59.0800	59.6872	59.8022	60.3434	60.3434	60.4447	60.1338	59.8022	59.5700	59.3292
alpha	4.9215	4.9302	4.9387	4.9791	4.9868	5.0229	5.0229	5.0296	5.0089	4.9868	4.9713	4.9553
util living area	0.9918	0.9823	0.9617	0.9119	0.8079	0.6345	0.4687	0.5014	0.7248	0.9233	0.9825	0.9936 (86)
MIT	19.9268	20.1115	20.3579	20.6389	20.8545	20.9671	20.9940	20.9916	20.9355	20.6655	20.2428	19.8902 (87)
Th 2	19.9356	19.9377	19.9397	19.9493	19.9511	19.9595	19.9595	19.9611	19.9563	19.9511	19.9475	19.9437 (88)
util rest of house	0.9892	0.9768	0.9497	0.8842	0.7514	0.5443	0.3610	0.3925	0.6398	0.8933	0.9760	0.9916 (89)
MIT 2	18.5327	18.8004	19.1526	19.5456	19.8164	19.9389	19.9575	19.9579	19.9102	19.5905	18.9995	18.4855 (90)
Living area fraction									fLA = Living area / (4) =			0.5025 (91)
MIT	19.2332	19.4592	19.7582	20.0949	20.3380	20.4556	20.4783	20.4773	20.4254	20.1306	19.6242	19.1913 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2332	19.4592	19.7582	20.0949	20.3380	20.4556	20.4783	20.4773	20.4254	20.1306	19.6242	19.1913 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9869	0.9737	0.9473	0.8885	0.7736	0.5886	0.4153	0.4474	0.6800	0.8992	0.9735	0.9896 (94)
Useful gains	415.6964	476.1129	509.0462	505.9472	449.7437	330.5525	225.0207	235.4976	346.9429	420.8370	408.5888	394.7383 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	895.4139	871.0669	791.5169	661.5390	509.4600	342.2594	226.6869	237.9205	371.0082	562.1088	741.5463	891.2219 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	356.9098	265.4091	210.1582	112.0261	44.4289	0.0000	0.0000	0.0000	0.0000	105.1062	239.7294	369.3838 (98)
Space heating												1703.1515 (98)
Space heating per m2											(98) / (4) =	33.5332 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												1821.5525 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	356.9098	265.4091	210.1582	112.0261	44.4289	0.0000	0.0000	0.0000	0.0000	105.1062	239.7294	369.3838 (98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000 (210)
Space heating fuel (main heating system)	381.7217	283.8600	224.7681	119.8141	47.5175	0.0000	0.0000	0.0000	0.0000	112.4131	256.3951	395.0629 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
Efficiency of water heater (217)m	86.7650	86.3387	85.5949	84.2040	82.1549	79.8000	79.8000	79.8000	79.8000	83.9477	85.9895	79.8000 (216)
Fuel for water heating, kWh/month	194.5082	172.5025	183.2531	167.7113	168.9879	156.2471	150.8144	164.4484	163.8315	174.4022	179.1431	189.7625 (219)
Water heating fuel used												2065.6122 (219)
Annual totals kWh/year												
Space heating fuel - main system												1821.5525 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												243.3763 (232)
Total delivered energy for all uses												4205.5410 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1821.5525	0.2160	393.4553 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2065.6122	0.2160	446.1722 (264)
Space and water heating			839.6276 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			1004.8649 (272)
Emissions per m2 for space and water heating			16.5314 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.5314 * 1.55) + 2.4870 + 0.7664, rounded to 2 d.p.			28.8800 (273)

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Calculation Type: New Build (As Designed)

Property Reference	010524			Issued on Date	29/04/2022
Assessment Reference	054	Prop Type Ref			
Property					
SAP Rating	84 B	DER	13.44	TER	24.01
Environmental	91 B	% DER<TER	44.02		
CO ₂ Emissions (t/year)	0.60	DFEE	29.49	TFEE	31.85
General Requirements Compliance	Fail	% DFEE<TFEE	7.42		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 24.01 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.44 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 31.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 29.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing South East: 6.24 m², No overhang
Windows facing South: 2.21 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 221.90 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)
External Wall	23.2500	8.4500	14.8000	0.1500	2.2200		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Total net area of external elements Aum(A, m ²)				40.7500			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	17.6881		(33)
Party Wall 1			33.3000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K	250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	5.5730 (36)
Total fabric heat loss	(33) + (36) = 23.2611 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	11.1341	11.0123	10.8905	10.2816	10.1599	9.5510	9.5510	9.4292	9.7945	10.1599	10.4034	10.6470 (38)
Heat transfer coeff	34.3952	34.2734	34.1516	33.5427	33.4209	32.8121	32.8121	32.6903	33.0556	33.4209	33.6645	33.9080 (39)
Average = Sum(39)m / 12 =												33.5123 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.6772	0.6748	0.6724	0.6604	0.6580	0.6460	0.6460	0.6436	0.6508	0.6580	0.6628	0.6676 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7134 (42)
Average daily hot water use (litres/day)	74.8927 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)	Total = Sum(45)m =											1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (56)													
If cylinder contains dedicated solar storage													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (57)													
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month													
177.4469 156.7782 165.5372 149.6214 147.5136 133.0871 129.0318 139.9117 139.1394 155.0886 162.4461 173.5921 173.5921 (62)													
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
177.4469 156.7782 165.5372 149.6214 147.5136 133.0871 129.0318 139.9117 139.1394 155.0886 162.4461 173.5921 173.5921 (64)													
Total per year (kWh/year) = Sum(64)m =													1829.1942 (64)
Heat gains from water heating, kWh/month													
84.8430 75.4698 80.8830 74.7574 74.8902 69.2597 68.7450 72.3625 71.2721 77.4089 79.0216 83.5613 83.5613 (65)													

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
13.4839 11.9763 9.7398 7.3736 5.5119 4.6534 5.0281 6.5357 8.7723 11.1384 13.0002 13.8587 13.8587 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
149.2855 150.8347 146.9309 138.6204 128.1298 118.2701 111.6832 110.1341 114.0378 122.3484 132.8390 142.6987 142.6987 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 (69)													
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													
-68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 (71)													
Water heating gains (Table 5)													
114.0363 112.3063 108.7138 103.8297 100.6589 96.1941 92.3992 97.2615 98.9891 104.0442 109.7522 112.3135 112.3135 (72)													
Total internal gains	325.5065	323.8179	314.0852	298.5244	283.0012	267.8182	257.8112	262.6320	270.4999	286.2317	304.2921	317.5716	317.5716 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W	
Southeast					6.2400	36.7938	0.4000	0.8000			0.7700	50.9147 (77)	
South					2.2100	46.7521	0.4000	0.8000			0.7700	22.9127 (78)	
Solar gains	73.8274	124.2516	166.4633	201.0539	220.9821	217.6723	210.5612	195.8614	178.4200	136.3256	88.1434	63.3710 (83)	
Total gains	399.3338	448.0695	480.5485	499.5783	503.9832	485.4906	468.3724	458.4934	448.9198	422.5573	392.4355	380.9426 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
tau	102.5459	102.9103	103.2773	105.1520	105.5351	107.4935	107.4935	107.8940	106.7015	105.5351	104.7716	104.0191	104.0191
alpha	7.8364	7.8607	7.8852	8.0101	8.0357	8.1662	8.1662	8.1929	8.1134	8.0357	7.9848	7.9346	7.9346
util living area	0.9816	0.9566	0.9003	0.7783	0.6118	0.4323	0.3082	0.3280	0.5070	0.7859	0.9502	0.9860	0.9860 (86)
MIT	20.6309	20.7506	20.8733	20.9654	20.9950	20.9997	21.0000	21.0000	20.9991	20.9685	20.8071	20.6066	20.6066 (87)
Th 2	20.3610	20.3631	20.3653	20.3759	20.3781	20.3887	20.3887	20.3909	20.3845	20.3781	20.3738	20.3695	20.3695 (88)
util rest of house	0.9769	0.9466	0.8808	0.7463	0.5726	0.3911	0.2654	0.2845	0.4623	0.7487	0.9373	0.9823	0.9823 (89)
MIT 2	19.8800	20.0494	20.2162	20.3399	20.3737	20.3886	20.3887	20.3909	20.3838	20.3471	20.1389	19.8527	19.8527 (90)
Living area fraction									fLA = Living area / (4) =			0.5025	0.5025 (91)
MIT	20.2573	20.4017	20.5464	20.6542	20.6859	20.6957	20.6959	20.6969	20.6930	20.6593	20.4747	20.2315	20.2315 (92)
Temperature adjustment												0.0000	0.0000
adjusted MIT	20.2573	20.4017	20.5464	20.6542	20.6859	20.6957	20.6959	20.6969	20.6930	20.6593	20.4747	20.2315	20.2315 (93)

8. Space heating requirement

Utilisation	0.9760	0.9473	0.8867	0.7609	0.5921	0.4118	0.2869	0.3064	0.4848	0.7660	0.9396	0.9814	0.9814 (94)
Useful gains	389.7582	424.4592	426.0892	380.1139	298.4043	199.9271	134.3903	140.4617	217.6151	323.6626	368.7183	373.8613	373.8613 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	4.2000 (96)
Heat loss rate W	548.8541	531.2971	479.7062	394.2683	300.3160	200.0113	134.3938	140.4677	217.9342	336.1928	450.2511	543.5979	543.5979 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	118.3674	71.7952	39.8911	10.1912	1.4223	0.0000	0.0000	0.0000	0.0000	9.3224	58.7036	126.2840	126.2840 (98)
Space heating												435.9771	435.9771 (98)
Space heating per m2												(98) / (4) =	8.5839 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	435.9771 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	488.7303 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	25.7226 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2050.5266 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	107.9225 (310b)
Electricity used for heat distribution	26.7290 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	238.1302 (332)
Energy saving/generation technologies (Appendices M, N and Q)	
Total delivered energy for all uses	3033.0236 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			250.0000 (367a)	
Space heating from Heat pump	1015.7028	0.5190	527.1497 (367)	
Efficiency of heat source Boilers			99.0000 (367b)	
Space heating from Boilers	134.9951	0.5190	70.0624 (368)	
Electrical energy for heat distribution	26.7290	0.5190	13.8724 (372)	
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			611.0845 (373)	
Space and water heating			611.0845 (376)	
Pumps and fans	121.9912	0.5190	63.3134 (378)	
Energy for lighting	238.1302	0.5190	123.5896 (379)	
Energy saving/generation technologies				
PV Unit	-221.9000	0.5190	-115.1661 (380)	
Total CO2, kg/year			682.8215 (383)	
Dwelling Carbon Dioxide Emission Rate (DER)			13.4400 (384)	

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			13.4400 ZC1
Total Floor Area		TFA	50.7900
Assumed number of occupants		N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			17.4175 ZC2
CO2 emissions from cooking, equation (L16)			3.1526 ZC3
Total CO2 emissions			34.0101 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			34.0101 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1575 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4075 (18)
					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)					
External Wall	23.2500	8.4500	14.8000	0.1800	2.6640		(29a)					
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)					
Total net area of external elements Aum(A, m2)			40.7500				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	18.5665	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.2380 (36)					
Total fabric heat loss						(33) + (36) =	22.8045 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 24.3480	Feb 24.2160	Mar 24.0867	Apr 23.4794	May 23.3658	Jun 22.8368	Jul 22.8368	Aug 22.7389	Sep 23.0406	Oct 23.3658	Nov 23.5957	Dec 23.8360 (38)
Heat transfer coeff	47.1524	47.0205	46.8912	46.2839	46.1702	45.6413	45.6413	45.5433	45.8450	46.1702	46.4001	46.6404 (39)
Average = Sum(39)m / 12 =												46.2833 (39)
HLP	Jan 0.9284	Feb 0.9258	Mar 0.9232	Apr 0.9113	May 0.9090	Jun 0.8986	Jul 0.8986	Aug 0.8967	Sep 0.9026	Oct 0.9090	Nov 0.9136	Dec 0.9183 (40)
HLP (average)												0.9113 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan 82.3820	Feb 79.3863	Mar 76.3906	Apr 73.3949	May 70.3992	Jun 67.4035	Jul 67.4035	Aug 70.3992	Sep 73.3949	Oct 76.3906	Nov 79.3863	Dec 82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)
Total per year (kWh/year) = Sum(63)m = 1726.9718 (64)												

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Southeast				6.2400	36.7938	0.6300	0.7000	0.7700	70.1668 (77)			
South				2.2100	46.7521	0.6300	0.7000	0.7700	31.5766 (78)			
Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains	421.2115	488.9806	537.3716	569.4289	581.3281	561.5651	541.7662	526.3621	510.2428	468.0154	419.7157	398.8747 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.8018	75.0116	75.2185	76.2055	76.3930	77.2784	77.2784	77.4446	76.9349	76.3930	76.0145	75.6229	
alpha	5.9868	6.0008	6.0146	6.0804	6.0929	6.1519	6.1519	6.1630	6.1290	6.0929	6.0676	6.0415	
util living area	0.9889	0.9730	0.9370	0.8515	0.7041	0.5156	0.3702	0.3972	0.6070	0.8698	0.9729	0.9916	(86)
MIT	20.2853	20.4578	20.6597	20.8547	20.9612	20.9951	20.9995	20.9992	20.9871	20.8586	20.5428	20.2509	(87)
Th 2	20.1434	20.1456	20.1478	20.1579	20.1598	20.1687	20.1687	20.1703	20.1653	20.1598	20.1560	20.1520	(88)
util rest of house	0.9856	0.9656	0.9207	0.8180	0.6511	0.4507	0.3005	0.3260	0.5389	0.8326	0.9642	0.9891	(89)
MIT 2	19.2067	19.4548	19.7375	20.0014	20.1256	20.1656	20.1685	20.1700	20.1564	20.0134	19.5868	19.1638	(90)
Living area fraction	19.7487	19.9588	20.2009	20.4301	20.5455	20.5824	20.5860	20.5866	20.5738	20.4381	20.0671	19.7100	(92)
Temperature adjustment	19.7487	19.9588	20.2009	20.4301	20.5455	20.5824	20.5860	20.5866	20.5738	20.4381	20.0671	19.7100	(93)
adjusted MIT	19.7487	19.9588	20.2009	20.4301	20.5455	20.5824	20.5860	20.5866	20.5738	20.4381	20.0671	19.7100	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9838	0.9637	0.9218	0.8294	0.6760	0.4832	0.3355	0.3618	0.5727	0.8458	0.9631	0.9875	(94)
Useful gains	414.3738	471.2466	495.3425	472.3095	393.0051	271.3738	181.7796	190.4392	292.2132	395.8707	404.2268	393.8933	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	728.4418	708.0700	642.4517	533.6598	408.3969	273.0447	181.9264	190.6722	296.7936	454.2273	601.6772	723.3942	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	233.6666	159.1454	109.4492	44.1722	11.4515	0.0000	0.0000	0.0000	0.0000	43.4173	142.1643	245.1486	(98)
Space heating												988.6151	(98)
Space heating per m2												19.4648	(99)
(98) / (4) =													

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1057.3423 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	233.6666	159.1454	109.4492	44.1722	11.4515	0.0000	0.0000	0.0000	0.0000	43.4173	142.1643	245.1486	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	249.9107	170.2090	117.0580	47.2430	12.2476	0.0000	0.0000	0.0000	0.0000	46.4356	152.0473	262.1911	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	85.6821	84.9908	83.8757	82.1132	80.5255	79.8000	79.8000	79.8000	79.8000	82.0180	84.6007	85.8696	(216)
Fuel for water heating, kWh/month	196.9666	175.2384	187.0092	171.9816	172.4072	156.2471	150.8144	164.4484	163.8315	178.5057	182.0840	192.0473	(219)
Water heating fuel used												2091.5813	(219)
Annual totals kWh/year													
Space heating fuel - main system												1057.3423	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												3467.3000	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1057.3423	0.2160	228.3859 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2091.5813	0.2160	451.7816 (264)
Space and water heating			680.1675 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			845.4048 (272)
Emissions per m2 for space and water heating			13.3918 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.3918 * 1.55) + 2.4870 + 0.7664, rounded to 2 d.p.			24.0100 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010525				Issued on Date	29/04/2022
Assessment Reference	055		Prop Type Ref			
Property						
SAP Rating	84 B	DER	12.84	TER	22.16	
Environmental	91 B	% DER<TER	42.07			
CO ₂ Emissions (t/year)	0.79	DFEE	31.99	TFEE	36.66	
General Requirements Compliance	Fail	% DFEE<TFEE	12.73			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 74 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 22.16 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.84 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 36.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 32.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading: Average
Windows facing South East: 6.24 m², No overhang
Windows facing South: 2.21 m², No overhang
Windows facing South West: 6.47 m², No overhang
Windows facing West: 1.97 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Exposed floor U-value 0.10 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 221.90 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												75.6500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			16.8900	1.1450	19.3397		(27)
Exposed			3.0900	0.1000	0.3090		(28b)
External Wall	52.9300	16.8900	36.0400	0.1500	5.4060		(29a)
Corridor	5.4000	1.8900	3.5100	0.2500	0.8775		(29a)
Total net area of external elements Aum(A, m2)			61.4200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		27.8222		(33)
Party Wall 1			34.6500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.8768 (36)
Total fabric heat loss							(33) + (36) = 37.6990 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	17.2447	17.0514	16.8580	15.8913	15.6980	14.7313	14.7313	14.5380	15.1180	15.6980	16.0847	16.4714 (38)
Average = Sum(39)m / 12 =	54.9437	54.7504	54.5570	53.5903	53.3970	52.4303	52.4303	52.2370	52.8170	53.3970	53.7837	54.1703 (39)
												53.5420 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7473	0.7447	0.7421	0.7289	0.7263	0.7131	0.7131	0.7105	0.7184	0.7263	0.7316	0.7368 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3285 (42)
Average daily hot water use (litres/day)													89.5010 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)	
Energy conte	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)	
Energy content (annual)										Total = Sum(45)m =		2408.1991 (45)	
Distribution loss (46)m = 0.15 x (45)m													
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)	

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	201.2769	177.6201	187.0442	168.3717	165.5050	148.6122	143.4181	156.4202	155.8451	174.5575	183.6979	196.6701	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
	Solar input (sum of months) = Sum (63)m =											0.0000 (63)	
Output from w/h													
	201.2769	177.6201	187.0442	168.3717	165.5050	148.6122	143.4181	156.4202	155.8451	174.5575	183.6979	196.6701	(64)
	Total per year (kWh/year) = Sum (64)m =											2059.0388 (64)	
Heat gains from water heating, kWh/month													
	92.7665	82.3997	88.0341	80.9919	80.8723	74.4219	73.5284	77.8516	76.8268	83.8823	86.0878	91.2347	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3088	16.2617	13.2249	10.0121	7.4842	6.3185	6.8273	8.8744	11.9112	15.1240	17.6520	18.8177 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385 (71)
Water heating gains (Table 5)	124.6861	122.6187	118.3254	112.4887	108.6993	103.3637	98.8285	104.6393	106.7039	112.7450	119.5664	122.6273 (72)
Total internal gains	406.2912	404.3077	391.6074	371.1252	350.3761	330.3110	317.2233	322.9500	333.4217	354.1083	377.8894	395.6798 (73)

[Jan	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Southeast	6.2400	36.7938	0.4000	0.8000	0.7700	50.9147 (77)
South	2.2100	46.7521	0.4000	0.8000	0.7700	22.9127 (78)
Southwest	6.4700	36.7938	0.4000	0.8000	0.7700	52.7913 (79)
West	1.9700	19.6403	0.4000	0.8000	0.7700	8.5802 (80)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil/m (see Table 9a)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	92.9234	93.2516	93.5820	95.2701	95.6150	97.3779	97.3779	97.7383	96.6650	95.6150	94.9276	94.2500		
alpha	7.1949	7.2168	7.2388	7.3513	7.3743	7.4919	7.4919	7.5159	7.4443	7.3743	7.3285	7.2833		
util living area														
	0.9907	0.9718	0.9211	0.7965	0.6197	0.4364	0.3120	0.3384	0.5357	0.8356	0.9726	0.9934	(86)	
MIT	20.4746	20.6357	20.8093	20.9458	20.9916	20.9995	21.0000	20.9999	20.9977	20.9366	20.6924	20.4445	(87)	
Th 2	20.2992	20.3015	20.3038	20.3154	20.3177	20.3292	20.3292	20.3316	20.3246	20.3177	20.3130	20.3084	(88)	
util rest of house														
	0.9880	0.9646	0.9036	0.7631	0.5769	0.3909	0.2644	0.2893	0.4843	0.7989	0.9643	0.9915	(89)	
MIT 2	19.6045	19.8360	20.0760	20.2585	20.3104	20.3289	20.3292	20.3315	20.3230	20.2533	19.9283	19.5686	(90)	
Living area fraction									fLA = Living area / (4) =			0.3678	(91)	
MIT	19.9245	20.1301	20.3457	20.5113	20.5610	20.5755	20.5759	20.5774	20.5711	20.5046	20.2093	19.8907	(92)	
Temperature adjustment												0.0000		
adjusted MIT	19.9245	20.1301	20.3457	20.5113	20.5610	20.5755	20.5759	20.5774	20.5711	20.5046	20.2093	19.8907	(93)	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9863	0.9625	0.9047	0.7730	0.5923	0.4076	0.2819	0.3073	0.5032	0.8095	0.9628	0.9900 (94)
Useful gains	534.0596	611.4760	641.2085	591.2872	468.8092	313.0750	208.4472	218.1916	340.7415	493.5933	519.8913	506.1822 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
	858.4701	833.8536	755.3804	622.2544	473.1488	313.2993	208.4586	218.2129	341.7867	528.8760	705.0683	849.9714 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
	241.3614	149.4378	84.9439	22.2964	3.2287	0.0000	0.0000	0.0000	0.0000	26.2503	133.3274	255.7792 (98)
Space heating												
Space heating per m2												916.6251 (98)
											(98) / (4) =	12.4677 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	916.6251 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1027.5367 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	54.0809 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2059.0388 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2308.1825 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	121.4833 (310b)
Electricity used for heat distribution	35.1128 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	170.9800 (330a)
Total electricity for the above, kWh/year	170.9800 (331)
Electricity for lighting (calculated in Appendix L)	323.3395 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	4005.6029 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1334.2877	0.5190	692.4953 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	177.3375	0.5190	92.0382 (368)
Electrical energy for heat distribution	35.1128	0.5190	18.2236 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			802.7571 (373)
Space and water heating			802.7571 (376)
Pumps and fans	170.9800	0.5190	88.7386 (378)
Energy for lighting	323.3395	0.5190	167.8132 (379)
Energy saving/generation technologies			
PV Unit	-221.9000	0.5190	-115.1661 (380)
Total CO2, kg/year			944.1428 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			12.8400 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		12.8400 ZC1
Total Floor Area	TFA	73.5200
Assumed number of occupants	N	2.3285
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.5530 ZC2
CO2 emissions from cooking, equation (L16)		2.3787 ZC3
Total CO2 emissions		31.7717 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		31.7717 ZC8

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1632 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4132 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3512 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4478	0.4390	0.4303	0.3864	0.3776	0.3337	0.3337	0.3249	0.3512	0.3776	0.3951	0.4127 (22b)
	0.6003	0.5964	0.5926	0.5746	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			16.4900	1.3258	21.8617		(27)
Exposed			3.0900	0.1300	0.4017		(28b)
External Wall	52.9300	16.4900	36.4400	0.1800	6.5592		(29a)
Corridor	5.4000	1.8900	3.5100	0.1800	0.6318		(29a)
Total net area of external elements Aum(A, m ²)			61.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.3444		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.8664 (36)
Total fabric heat loss						(33) + (36) =	39.2108 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.4091	36.1729	35.9414	34.8541	34.6506	33.7036	33.7036	33.5282	34.0684	34.6506	35.0622	35.4924 (38)
Heat transfer coeff	75.6199	75.3837	75.1523	74.0649	73.8615	72.9144	72.9144	72.7391	73.2792	73.8615	74.2730	74.7033 (39)
Average = Sum(39)m / 12 =												74.0639 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0286	1.0254	1.0222	1.0074	1.0046	0.9918	0.9918	0.9894	0.9967	1.0046	1.0102	1.0161 (40)
HLP (average)												1.0074 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy content (annual)	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1408.1991 (45)
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
Heat gains from water heating, kWh/month	85.8210	76.1264	81.0886	74.2704	73.9268	67.7004	66.5829	70.9061	70.1053	76.9367	79.3664	84.2892 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3070	16.2601	13.2236	10.0111	7.4834	6.3178	6.8266	8.8735	11.9100	15.1225	17.6502	18.8158	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	(71)
Water heating gains (Table 5)	115.3508	113.2833	108.9900	103.1533	99.3640	94.0283	89.4931	95.3039	97.3685	103.4096	110.2311	113.2919	(72)
Total internal gains	399.9539	397.9707	385.2706	364.7888	344.0400	323.9750	310.8872	316.6137	327.0851	347.7714	371.5522	389.3425	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c	Access factor Table 6d		Gains W	
Southeast				6.0900	36.7938	0.6300		0.7000	0.7700		68.4801 (77)	
South				2.1600	46.7521	0.6300		0.7000	0.7700		30.8622 (78)	
Southwest				6.3200	36.7938	0.6300		0.7000	0.7700		71.0663 (79)	
West				1.9200	19.6403	0.6300		0.7000	0.7700		11.5245 (80)	
Solar gains	181.9330	310.7877	426.7420	529.8924	593.5562	589.0095	567.9937	520.7143	462.5933	343.9756	218.0963	155.5675 (83)
Total gains	581.8870	708.7584	812.0126	894.6812	937.5962	912.9845	878.8809	837.3280	789.6784	691.7470	589.6485	544.9100 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	67.5160	67.7275	67.9362	68.9335	69.1234	70.0212	70.0212	70.1900	69.6726	69.1234	68.7404	68.3445	
alpha	5.5011	5.5152	5.5291	5.5956	5.6082	5.6681	5.6681	5.6793	5.6448	5.6082	5.5827	5.5563	
util living area	0.9924	0.9779	0.9413	0.8491	0.6934	0.5055	0.3643	0.3983	0.6207	0.8894	0.9807	0.9945	(86)
MIT	20.1046	20.3196	20.5745	20.8210	20.9517	20.9932	20.9991	20.9986	20.9797	20.7993	20.4047	20.0663	(87)
Th 2	20.0596	20.0623	20.0649	20.0772	20.0795	20.0902	20.0902	20.0922	20.0861	20.0795	20.0748	20.0699	(88)
util rest of house	0.9900	0.9715	0.9252	0.8136	0.6368	0.4362	0.2894	0.3204	0.5464	0.8538	0.9740	0.9928	(89)
MIT 2	18.8816	19.1923	19.5512	19.8852	20.0374	20.0861	20.0899	20.0916	20.0722	19.8689	19.3273	18.8338	(90)
Living area fraction									fLA = Living area / (4) =			0.3678	(91)
MIT	19.3314	19.6069	19.9276	20.2294	20.3737	20.4198	20.4243	20.4252	20.4060	20.2111	19.7236	19.2871	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3314	19.6069	19.9276	20.2294	20.3737	20.4198	20.4243	20.4252	20.4060	20.2111	19.7236	19.2871	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	574.6550	685.8360	749.0879	733.5510	614.5731	421.3740	278.5620	292.3011	452.5131	594.5128	572.4048	539.9046	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1136.6763	1108.6607	1009.1123	839.1086	640.6509	424.3447	278.8464	292.7890	462.0953	709.8883	937.5894	1127.0568	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	418.1438	284.1382	193.4581	76.0014	19.4018	0.0000	0.0000	0.0000	0.0000	85.8394	262.9329	436.8412	(98)
Space heating												1776.7570	(98)
Space heating per m2												24.1670	(99)

8c. Space cooling requirement

Not applicable

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												1900.2748 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	418.1438	284.1382	193.4581	76.0014	19.4018	0.0000	0.0000	0.0000	0.0000	85.8394	262.9329	436.8412 (98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000 (210)
Space heating fuel (main heating system)	447.2126	303.8911	206.9071	81.2850	20.7506	0.0000	0.0000	0.0000	0.0000	91.8069	281.2117	467.2099 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
Efficiency of water heater (217)m	86.8286	86.1780	85.0308	82.9591	80.8525	79.8000	79.8000	79.8000	79.8000	83.1527	85.8931	79.8000 (216)
Fuel for water heating, kWh/month	221.8106	197.0089	209.7620	192.8298	193.9620	175.7022	168.8423	185.1357	184.7660	199.4832	204.0863	86.9907 (217)
Water heating fuel used												216.1016 (219)
Annual totals kWh/year												2349.4907 (219)
Space heating fuel - main system												1900.2748 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												323.3067 (232)
Total delivered energy for all uses												4648.0723 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1900.2748	0.2160	410.4594 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2349.4907	0.2160	507.4900 (264)
Space and water heating			917.9494 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	323.3067	0.5190	167.7962 (268)
Total CO2, kg/m2/year			1124.6706 (272)
Emissions per m2 for space and water heating			12.4857 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.2823 (272b)
Emissions per m2 for pumps and fans			0.5294 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.4857 * 1.55) + 2.2823 + 0.5294, rounded to 2 d.p.			22.1600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010526			Issued on Date	29/04/2022
Assessment Reference	056	Prop Type Ref			
Property					
SAP Rating	84 B	DER	14.45	TER	24.46
Environmental	90 B	% DER<TER	40.92		
CO ₂ Emissions (t/year)	0.85	DFEE	38.93	TFEE	43.43
General Requirements Compliance	Pass	% DFEE<TFEE	10.36		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aecom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 24.46 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.45 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)43.4 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)38.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.61	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing West:	5.93 m ² , No overhang
Windows facing North West:	7.10 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	221.90 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main		secondary		other		total		m3 per hour			
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =		0.0000	(6a)		
Number of open flues	0	+	0	+	0	=	0 * 20 =		0.0000	(6b)		
Number of intermittent fans							0 * 10 =		0.0000	(7a)		
Number of passive vents							0 * 10 =		0.0000	(7b)		
Number of flueless gas fires							0 * 40 =		0.0000	(7c)		
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =		0.0000	(8)		
Pressure test									Yes			
Measured/design AP50									3.0000			
Infiltration rate									0.1500	(18)		
Number of sides sheltered									2	(19)		
Shelter factor							(20) = 1 - [0.075 x (19)] =		0.8500	(20)		
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =		0.1275	(21)		
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716
												(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			13.0300	1.1450	14.9198		(27)					
External Wall	35.0800	13.0300	22.0500	0.1500	3.3075		(29a)					
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)					
Core	18.2300		18.2300	0.2500	4.5575		(29a)					
Total net area of external elements Aum(A, m2)			70.8100				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =	28.5773			(33)					
Party Wall 1			18.3000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.0260 (36)					
Total fabric heat loss						(33) + (36) =	37.6033 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 17.0688	Feb 16.8774	Mar 16.6860	Apr 15.7292	May 15.5379	Jun 14.5811	Jul 14.5811	Aug 14.3897	Sep 14.9638	Oct 15.5379	Nov 15.9206	Dec 16.3033 (38)
Heat transfer coeff	54.6721	54.4808	54.2894	53.3326	53.1412	52.1844	52.1844	51.9930	52.5671	53.1412	53.5239	53.9067 (39)
Average = Sum(39)m / 12 =												53.2847 (39)
HLP	Jan 0.7513	Feb 0.7487	Mar 0.7460	Apr 0.7329	May 0.7303	Jun 0.7171	Jul 0.7171	Aug 0.7145	Sep 0.7224	Oct 0.7303	Nov 0.7355	Dec 0.7408 (40)
HLP (average)												0.7322 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	Jan 98.0067	Feb 94.4428	Mar 90.8789	Apr 87.3151	May 83.7512	Jun 80.1873	Jul 80.1873	Aug 83.7512	Sep 87.3151	Oct 90.8789	Nov 94.4428	Dec 98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)												Total = Sum(45)m = 1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m	21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
	Solar input (sum of months) = Sum (63)m =											0.0000 (63)	
Output from w/h													
	200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(64)
	Total per year (kWh/year) = Sum (64)m =											2052.6825 (64)	
Heat gains from water heating, kWh/month													
	92.5474	82.2081	87.8363	80.8195	80.7069	74.2791	73.3961	77.6998	76.6732	83.7032	85.8924	91.0225	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.2451	16.2051	13.1789	9.9773	7.4581	6.2965	6.8035	8.8435	11.8697	15.0713	17.5905	18.7521 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581 (71)
Water heating gains (Table 5)	124.3916	122.3335	118.0596	112.2492	108.4770	103.1654	98.6507	104.4353	106.4905	112.5044	119.2950	122.3421 (72)
Total internal gains	403.9823	401.9977	389.3716	369.0214	348.4174	328.4923	315.4981	321.2091	331.6165	352.1703	375.7927	393.4532 (73)

[Jan											Area		Solar flux		g		FF		Access		Gains	
											m2		Table 6a		Table 6b		Table 6c		factor		W	
													W/m2		or Table 6b		or Table 6c		Table 6d			
West											5.9300		19.6403		0.4000		0.8000		0.7700		25.8277 (80)	
Northwest											7.1000		11.2829		0.4000		0.8000		0.7700		17.7649 (81)	
Solar gains	43.5926	86.6855	148.3572	228.3479	292.5450	305.5740	288.3795	238.8530	176.1598	104.1431	54.5570			35.7472 (83)								
Total gains	447.5749	488.6831	537.7288	597.3693	640.9623	634.0663	603.8776	560.0621	507.7763	456.3135	430.3497	429.2004	(84)									

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil/m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	92.4323	92.7570	93.0840	94.7539	95.0951	96.8387	96.8387	97.1952	96.1337	95.0951	94.4152	93.7448
alpha	7.1622	7.1838	7.2056	7.3169	7.3397	7.4559	7.4559	7.4797	7.4089	7.3397	7.2943	7.2497
util living area	0.9969	0.9933	0.9787	0.9109	0.7415	0.5246	0.3801	0.4266	0.6964	0.9464	0.9921	0.9977 (86)
MIT	20.3503	20.4546	20.6365	20.8587	20.9735	20.9981	20.9999	20.9997	20.9873	20.8312	20.5575	20.3342 (87)
Th 2	20.2957	20.2980	20.3003	20.3119	20.3142	20.3257	20.3257	20.3281	20.3211	20.3142	20.3096	20.3049 (88)
util rest of house	0.9960	0.9913	0.9723	0.8878	0.6958	0.4703	0.3219	0.3645	0.6350	0.9270	0.9894	0.9969 (89)
MIT 2	19.4218	19.5752	19.8385	20.1517	20.2901	20.3246	20.3257	20.3279	20.3117	20.1233	19.7345	19.4057 (90)
Living area fraction									fLA = Living area / (4)			0.3848 (91)
MIT	19.7791	19.9135	20.1455	20.4237	20.5531	20.5837	20.5851	20.5864	20.5716	20.3957	20.0512	19.7629 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7791	19.9135	20.1455	20.4237	20.5531	20.5837	20.5851	20.5864	20.5716	20.3957	20.0512	19.7629 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9951	0.9899	0.9706	0.8919	0.7122	0.4912	0.3443	0.3884	0.6582	0.9296	0.9881	0.9962 (94)
Useful gains	445.3617	483.7480	521.9366	532.7852	456.4696	311.4492	207.9112	217.5498	334.2148	424.1858	425.2105	427.5674 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	846.2743	817.9489	740.8079	614.5912	470.4620	312.2573	207.9593	217.6631	340.1959	520.5558	693.1968	838.9467 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	298.2790	224.5830	162.8402	58.9004	10.4104	0.0000	0.0000	0.0000	0.0000	71.6993	192.9501	306.0662 (98)
Space heating												1325.7286 (98)
Space heating per m2												18.2181 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1325.7286 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1486.1418 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	78.2180 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2052.6825 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2301.0570 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	121.1083 (310b)
Electricity used for heat distribution	39.8653 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	169.2357 (330a)
Total electricity for the above, kWh/year	169.2357 (331)
Electricity for lighting (calculated in Appendix L)	322.2135 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	4477.9742 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1514.8795	0.5190	786.2225 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	201.3396	0.5190	104.4953 (368)
Electrical energy for heat distribution	39.8653	0.5190	20.6901 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			911.4078 (373)
Space and water heating			911.4078 (376)
Pumps and fans	169.2357	0.5190	87.8333 (378)
Energy for lighting	322.2135	0.5190	167.2288 (379)
Energy saving/generation technologies			
PV Unit	-221.9000	0.5190	-115.1661 (380)
Total CO2, kg/year			1051.3039 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.4500 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		14.4500 ZC1
Total Floor Area	TFA	72.7700
Assumed number of occupants	N	2.3115
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.5855 ZC2
CO2 emissions from cooking, equation (L16)		2.3976 ZC3
Total CO2 emissions		33.4331 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		33.4331 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1649 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4149 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3527 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4497	0.4408	0.4320	0.3879	0.3791	0.3350	0.3350	0.3262	0.3527	0.3791	0.3968	0.4144 (22b)
	0.6011	0.5972	0.5933	0.5752	0.5719	0.5561	0.5561	0.5532	0.5622	0.5719	0.5787	0.5859 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			13.0300	1.3258	17.2746		(27)
External Wall	35.0800	13.0300	22.0500	0.1800	3.9690		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Core	18.2300		18.2300	0.1800	3.2814		(29a)
Total net area of external elements Aum(A, m ²)			70.8100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.2248		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.9338 (36)
Total fabric heat loss						(33) + (36) =	36.1586 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.0868	35.8511	35.6201	34.5351	34.3321	33.3870	33.3870	33.2120	33.7511	34.3321	34.7427	35.1721 (38)
Heat transfer coeff	72.2454	72.0097	71.7787	70.6937	70.4907	69.5457	69.5457	69.3707	69.9097	70.4907	70.9014	71.3307 (39)
Average = Sum(39)m / 12 =												70.6927 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9928	0.9896	0.9864	0.9715	0.9687	0.9557	0.9557	0.9533	0.9607	0.9687	0.9743	0.9802 (40)
HLP (average)												0.9715 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)												Total = Sum(45)m = 1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m	21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (64)
Heat gains from water heating, kWh/month	85.6018	75.9347	80.8908	74.0980	73.7613	67.5576	66.4506	70.7543	69.9517	76.7577	79.1709	84.0770 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5611	16.4858	13.4072	10.1501	7.5873	6.4055	6.9214	8.9967	12.0753	15.3324	17.8952	19.0770 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581 (71)
Water heating gains (Table 5)	115.0562	112.9981	108.7242	102.9139	99.1416	93.8300	89.3153	95.0999	97.1551	103.1690	109.9597	113.0067 (72)
Total internal gains	397.9629	395.9430	383.2645	362.8588	342.2112	322.2660	309.2806	315.0269	325.4868	346.0960	369.7620	387.4427 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
West					5.9300	19.6403	0.6300	0.7000	0.7700		35.5938 (80)	
Northwest					7.1000	11.2829	0.6300	0.7000	0.7700		24.4823 (81)	
Solar gains	60.0761	119.4634	204.4548	314.6920	403.1636	421.1192	397.4230	329.1693	242.7702	143.5223	75.1863	49.2641 (83)
Total gains	458.0390	515.4064	587.7193	677.5508	745.3747	743.3852	706.7036	644.1963	568.2570	489.6183	444.9483	436.7067 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	69.9487	70.1776	70.4035	71.4841	71.6899	72.6641	72.6641	72.8474	72.2857	71.6899	71.2747	70.8457
alpha	5.6632	5.6785	5.6936	5.7656	5.7793	5.8443	5.8443	5.8565	5.8190	5.7793	5.7516	5.7230
util living area	0.9974	0.9944	0.9828	0.9316	0.7927	0.5864	0.4311	0.4912	0.7754	0.9655	0.9943	0.9980 (86)
MIT	20.0040	20.1401	20.3839	20.7010	20.9136	20.9877	20.9983	20.9964	20.9442	20.6525	20.2759	19.9845 (87)
Th 2	20.0893	20.0920	20.0947	20.1072	20.1095	20.1204	20.1204	20.1224	20.1162	20.1095	20.1048	20.0998 (88)
util rest of house	0.9966	0.9926	0.9771	0.9100	0.7403	0.5111	0.3460	0.3997	0.7018	0.9502	0.9921	0.9974 (89)
MIT 2	18.7578	18.9580	19.3123	19.7639	20.0294	20.1127	20.1198	20.1210	20.0736	19.7086	19.1663	18.7372 (90)
Living area fraction									fLA = Living area / (4) =			0.3848 (91)
MIT	19.2373	19.4129	19.7246	20.1245	20.3697	20.4494	20.4578	20.4579	20.4086	20.0718	19.5932	19.2171 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2373	19.4129	19.7246	20.1245	20.3697	20.4494	20.4578	20.4579	20.4086	20.0718	19.5932	19.2171 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	455.9752	510.6463	572.5002	616.8998	563.9083	401.2764	267.7126	280.2491	413.5599	464.8498	440.6866	435.1803 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1079.1536	1045.0670	949.2458	793.4987	611.1296	406.7984	268.2928	281.4960	441.0304	667.6731	885.7866	1071.1833 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	463.6448	359.1307	280.2987	127.1512	35.1326	0.0000	0.0000	0.0000	0.0000	150.9006	320.4720	473.1862 (98)
Space heating												2209.9168 (98)
Space heating per m2										(98) / (4) =		30.3685 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2363.5474 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	463.6448	359.1307	280.2987	127.1512	35.1326	0.0000	0.0000	0.0000	0.0000	150.9006	320.4720	473.1862	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	495.8767	384.0970	299.7847	135.9906	37.5750	0.0000	0.0000	0.0000	0.0000	161.3910	342.7508	506.0815	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500	(64)
Efficiency of water heater (217)m	87.0815	86.7738	86.0237	84.2175	81.5697	79.8000	79.8000	79.8000	79.8000	84.5713	86.4121	79.8000	(216)
Fuel for water heating, kWh/month	220.4096	194.9920	206.6495	189.3327	191.6465	175.1642	168.3438	184.5636	184.1870	195.5004	202.1805	214.8896	(219)
Water heating fuel used												2327.8595	(219)
Annual totals kWh/year												2363.5474	(211)
Space heating fuel - main system												0.0000	(215)
Space heating fuel - secondary													
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												327.7949	(232)
Total delivered energy for all uses												5094.2017	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2363.5474	0.2160	510.5262 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2327.8595	0.2160	502.8176 (264)
Space and water heating			1013.3439 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	327.7949	0.5190	170.1255 (268)
Total CO2, kg/m2/year			1222.3944 (272)
Emissions per m2 for space and water heating			13.9253 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3379 (272b)
Emissions per m2 for pumps and fans			0.5349 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.9253 * 1.55) + 2.3379 + 0.5349, rounded to 2 d.p.			24.4600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010527	Issued on Date	29/04/2022
Assessment Reference	057	Prop Type Ref	
Property			
SAP Rating	84 B	DER	14.79
Environmental	89 B	TER	25.12
CO ₂ Emissions (t/year)	0.86	% DER<TER	41.13
General Requirements Compliance	Pass	DFEE	40.33
		TFEE	45.36
		% DFEE<TFEE	11.09
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aecom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 25.12 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.79 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)45.4 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)40.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.61	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing North:	5.88 m ² , No overhang
Windows facing North West:	7.10 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	221.90 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												75.6500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			12.9800	1.1450	14.8626		(27)
External Wall	35.0800	12.9800	22.1000	0.1500	3.3150		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Core	18.2300		18.2300	0.2500	4.5575		(29a)
Total net area of external elements Aum(A, m ²)			70.8100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	28.5276			(33)
Party Wall 1			18.3000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.0240 (36)
Total fabric heat loss							(33) + (36) = 37.5516 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	17.0688	16.8774	16.6860	15.7292	15.5379	14.5811	14.5811	14.3897	14.9638	15.5379	15.9206	16.3033 (38)
Heat transfer coeff	54.6204	54.4290	54.2376	53.2808	53.0895	52.1327	52.1327	51.9413	52.5154	53.0895	53.4722	53.8549 (39)
Average = Sum(39)m / 12 =												53.2330 (39)
HLP	0.7506	0.7480	0.7453	0.7322	0.7296	0.7164	0.7164	0.7138	0.7217	0.7296	0.7348	0.7401 (40)
HLP (average)												0.7315 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy content (annual)	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1401.8427 (45)
	21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
	Solar input (sum of months) = Sum (63)m =											0.0000 (63)	
Output from w/h													
	200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(64)
	Total per year (kWh/year) = Sum (64)m =											2052.6825 (64)	
Heat gains from water heating, kWh/month													
	92.5474	82.2081	87.8363	80.8195	80.7069	74.2791	73.3961	77.6998	76.6732	83.7032	85.8924	91.0225	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.2514	16.2107	13.1835	9.9807	7.4607	6.2986	6.8059	8.8466	11.8739	15.0766	17.5966	18.7587 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581 (71)
Water heating gains (Table 5)	124.3916	122.3335	118.0596	112.2492	108.4770	103.1654	98.6507	104.4353	106.4905	112.5044	119.2950	122.3421 (72)
Total internal gains	403.9886	402.0033	389.3762	369.0248	348.4200	328.4945	315.5005	321.2122	331.6207	352.1755	375.7988	393.4597 (73)

[Jan																				
	Area				Solar flux		g		FF		Access		Gains							
	m2				Table 6a		Table 6b		Table 6c		factor		W							
					W/m2		or Table 6b		or Table 6c		Table 6d									
North	5.8800				10.6334		0.4000		0.8000		0.7700		13.8654							
Northwest	7.1000				11.2829		0.4000		0.8000		0.7700		17.7649 (71)							
Solar gains	31.6303	62.6585	110.1764	179.3190	241.2494	257.6284	240.8129	191.6050	133.5227	75.7335	39.4577	26.0666 (83)								
Total gains	435.6190	464.6619	499.5526	548.3439	589.6693	586.1229	556.3134	512.8172	465.1433	427.9090	415.2565	419.5263 (84)								

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil/m, (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	92.5199	92.8452	93.1728	94.8460	95.1878	96.9349	96.9349	97.2920	96.2284	95.1878	94.5065	93.8349	
alpha	7.1680	7.1897	7.2115	7.3231	7.3459	7.4623	7.4623	7.4861	7.4152	7.3459	7.3004	7.2557	
util living area													
	0.9974	0.9951	0.9858	0.9383	0.7895	0.5656	0.4120	0.4651	0.7482	0.9607	0.9937	0.9980	(86)
MIT	20.3351	20.4236	20.5904	20.8181	20.9606	20.9970	20.9997	20.9994	20.9800	20.8029	20.5384	20.3220	(87)
Th 2	20.2964	20.2987	20.3010	20.3125	20.3148	20.3264	20.3264	20.3287	20.3217	20.3148	20.3102	20.3056	(88)
util rest of house													
	0.9966	0.9935	0.9813	0.9202	0.7450	0.5077	0.3491	0.3977	0.6864	0.9453	0.9914	0.9973	(89)
MIT 2	19.4002	19.5308	19.7738	20.1007	20.2779	20.3244	20.3263	20.3284	20.3064	20.0870	19.7075	19.3885	(90)
Living area fraction									fLA = Living area / (4) =			0.3848	(91)
MIT	19.7599	19.8743	20.0880	20.3768	20.5406	20.5832	20.5854	20.5866	20.5656	20.3625	20.0272	19.7477	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7599	19.8743	20.0880	20.3768	20.5406	20.5832	20.5854	20.5866	20.5656	20.3625	20.0272	19.7477	(93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9958	0.9924	0.9797	0.9221	0.7603	0.5299	0.3733	0.4236	0.7094	0.9465	0.9902	0.9967 (94)
Useful gains	433.7759	461.1113	489.3899	505.6010	448.2974	310.5953	207.6860	217.2540	329.9803	405.0233	411.1804	418.1312 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	844.4279	815.0368	736.9830	611.4918	469.3412	311.9195	207.7696	217.4577	339.5426	518.2851	691.2470	837.3188 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.9195	0.7096	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	305.5251	237.8380	184.2092	76.2414	15.6565	0.0000	0.0000	0.0000	0.0000	84.2667	201.6479	311.8756 (98)
Space heating												1417.2605 (98)
Space heating per m2												19.4759 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1417.2605 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1588.7490 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	83.6184 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2052.6825 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2301.0570 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	121.1083 (310b)
Electricity used for heat distribution	40.9453 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	169.2357 (330a)
Total electricity for the above, kWh/year	169.2357 (331)
Electricity for lighting (calculated in Appendix L)	322.3254 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	4586.0938 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1555.9224	0.5190	807.5237 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	206.7946	0.5190	107.3264 (368)
Electrical energy for heat distribution	40.9453	0.5190	21.2506 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			936.1007 (373)
Space and water heating			936.1007 (376)
Pumps and fans	169.2357	0.5190	87.8333 (378)
Energy for lighting	322.3254	0.5190	167.2869 (379)
Energy saving/generation technologies			
PV Unit	-221.9000	0.5190	-115.1661 (380)
Total CO2, kg/year			1076.0549 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.7900 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER	14.7900 ZC1
Total Floor Area	72.7700 TFA
Assumed number of occupants	2.3115 N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190 EF
CO2 emissions from appliances, equation (L14)	16.5855 ZC2
CO2 emissions from cooking, equation (L16)	2.3976 ZC3
Total CO2 emissions	33.7731 ZC4
Residual CO2 emissions offset from biofuel CHP	0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year	0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000 ZC7
Net CO2 emissions	33.7731 ZC8

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1649 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4149 (18)
Number of sides sheltered					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3527 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4497	0.4408	0.4320	0.3879	0.3791	0.3350	0.3350	0.3262	0.3527	0.3791	0.3968	0.4144 (22b)
	0.6011	0.5972	0.5933	0.5752	0.5719	0.5561	0.5561	0.5532	0.5622	0.5719	0.5787	0.5859 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			12.9800	1.3258	17.2083		(27)
External Wall	35.0800	12.9800	22.1000	0.1800	3.9780		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Core	18.2300		18.2300	0.1800	3.2814		(29a)
Total net area of external elements Aum(A, m ²)			70.8100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.1675		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.9318 (36)
Total fabric heat loss							(33) + (36) = 36.0993 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.0868	35.8511	35.6201	34.5351	34.3321	33.3870	33.3870	33.2120	33.7511	34.3321	34.7427	35.1721 (38)
Heat transfer coeff	72.1861	71.9504	71.7194	70.6344	70.4314	69.4864	69.4864	69.3114	69.8504	70.4314	70.8421	71.2714 (39)
Average = Sum(39)m / 12 =												70.6334 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9920	0.9887	0.9856	0.9707	0.9679	0.9549	0.9549	0.9525	0.9599	0.9679	0.9735	0.9794 (40)
HLP (average)												0.9706 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)												Total = Sum(45)m = 1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m	21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

FULL SAP CALCULATION PRINTOUT

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Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (64)
Heat gains from water heating, kWh/month	85.6018	75.9347	80.8908	74.0980	73.7613	67.5576	66.4506	70.7543	69.9517	76.7577	79.1709	84.0770 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5727	16.4961	13.4155	10.1564	7.5920	6.4095	6.9257	9.0023	12.0829	15.3420	17.9064	19.0889	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	(71)
Water heating gains (Table 5)	115.0562	112.9981	108.7242	102.9139	99.1416	93.8300	89.3153	95.0999	97.1551	103.1690	109.9597	113.0067	(72)
Total internal gains	397.9745	395.9533	383.2729	362.8651	342.2159	322.2700	309.2849	315.0325	325.4943	346.1056	369.7732	387.4546	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
North					5.8800	10.6334	0.6300	0.7000			0.7700	19.1083
Northwest					7.1000	11.2829	0.6300	0.7000			0.7700	24.4823 (74)
Solar gains	43.5906	86.3513	151.8369	247.1241	332.4718	355.0441	331.8703	264.0557	184.0109	104.3702	54.3776	35.9231 (83)
Total gains	441.5651	482.3046	535.1098	609.9892	674.6877	677.3141	641.1552	579.0882	509.5053	450.4758	424.1508	423.3777 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.0062	70.2355	70.4617	71.5441	71.7503	72.7261	72.7261	72.9097	72.3471	71.7503	71.3343	70.9046	
alpha	5.6671	5.6824	5.6974	5.7696	5.7834	5.8484	5.8484	5.8606	5.8231	5.7834	5.7556	5.7270	
util living area	0.9979	0.9960	0.9889	0.9545	0.8397	0.6362	0.4736	0.5430	0.8287	0.9760	0.9955	0.9983	(86)
MIT	19.9836	20.0984	20.3204	20.6365	20.8819	20.9815	20.9972	20.9941	20.9201	20.6091	20.2500	19.9681	(87)
Th 2	20.0900	20.0927	20.0954	20.1079	20.1102	20.1211	20.1211	20.1231	20.1169	20.1102	20.1055	20.1005	(88)
util rest of house	0.9972	0.9946	0.9849	0.9385	0.7919	0.5574	0.3808	0.4434	0.7605	0.9646	0.9938	0.9978	(89)
MIT 2	18.7286	18.8981	19.2224	19.6795	19.9967	20.1091	20.1200	20.1207	20.0527	19.6502	19.1293	18.7138	(90)
Living area fraction									fLA = Living area / (4) =			0.3848	(91)
MIT	19.2115	19.3600	19.6449	20.0477	20.3373	20.4448	20.4575	20.4567	20.3864	20.0191	19.5605	19.1964	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2115	19.3600	19.6449	20.0477	20.3373	20.4448	20.4575	20.4567	20.3864	20.0191	19.5605	19.1964	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	439.8910	479.0073	525.7142	571.6804	543.1729	397.7128	267.0934	279.0667	399.0692	433.8591	420.8839	422.1033	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1076.4016	1040.4026	942.7446	787.4135	608.3350	406.1338	268.0464	281.1779	439.1104	663.4031	882.7278	1068.8176	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	473.5639	377.2577	310.2706	155.3278	48.4806	0.0000	0.0000	0.0000	0.0000	170.7807	332.5276	481.1554	(98)
Space heating												2349.3643	(98)
Space heating per m2												(98) / (4) =	32.2848 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2512.6891 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	473.5639	377.2577	310.2706	155.3278	48.4806	0.0000	0.0000	0.0000	0.0000	170.7807	332.5276	481.1554	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	506.4855	403.4841	331.8402	166.1260	51.8509	0.0000	0.0000	0.0000	0.0000	182.6532	355.6445	514.6047	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500	(64)
Efficiency of water heater (217)m	87.1305	86.8925	86.2858	84.7441	82.0977	79.8000	79.8000	79.8000	79.8000	84.9002	86.5049	79.8000	(216)
Fuel for water heating, kWh/month	220.2856	194.7257	206.0218	188.1562	190.4140	175.1642	168.3438	184.5636	184.1870	194.7429	201.9634	214.7958	(219)
Water heating fuel used												2323.3639	(219)
Annual totals kWh/year													
Space heating fuel - main system												2512.6891	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												327.9999	(232)
Total delivered energy for all uses												5239.0529	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2512.6891	0.2160	542.7409 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2323.3639	0.2160	501.8466 (264)
Space and water heating			1044.5875 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	327.9999	0.5190	170.2319 (268)
Total CO2, kg/m2/year			1253.7444 (272)
Emissions per m2 for space and water heating			14.3546 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3393 (272b)
Emissions per m2 for pumps and fans			0.5349 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.3546 * 1.55) + 2.3393 + 0.5349, rounded to 2 d.p.			25.1200 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010528	Issued on Date	29/04/2022
Assessment Reference	058	Prop Type Ref	
Property			
SAP Rating	84 B	DER	13.48
Environmental	90 B	TER	23.07
CO ₂ Emissions (t/year)	0.82	% DER<TER	41.57
General Requirements Compliance	Fail	DFEE	35.01
		TFEE	39.57
		% DFEE<TFEE	11.53
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 74 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 23.07 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.48 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 39.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 35.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading: Average
Windows facing North: 1.97 m², No overhang
Windows facing North East: 9.35 m², No overhang
Windows facing South East: 6.24 m², No overhang
Windows facing South: 2.21 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 221.90 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							2	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1275 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			19.7700	1.1450	22.6374		(27)					
External Wall	49.6500	19.7700	29.8800	0.1500	4.4820		(29a)					
Corridor	5.4000	1.8900	3.5100	0.2500	0.8775		(29a)					
Total net area of external elements Aum(A, m2)			55.0500				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		29.8869		(33)					
Party Wall 1			38.0500	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.8790 (36)					
Total fabric heat loss							(33) + (36) = 38.7659 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 17.2447	Feb 17.0514	Mar 16.8580	Apr 15.8913	May 15.6980	Jun 14.7313	Jul 14.7313	Aug 14.5380	Sep 15.1180	Oct 15.6980	Nov 16.0847	Dec 16.4714 (38)
Heat transfer coeff	56.0106	55.8173	55.6239	54.6573	54.4639	53.4972	53.4972	53.3039	53.8839	54.4639	54.8506	55.2373 (39)
Average = Sum(39)m / 12 =	54.6089 (39)											
HLP	Jan 0.7618	Feb 0.7592	Mar 0.7566	Apr 0.7434	May 0.7408	Jun 0.7277	Jul 0.7277	Aug 0.7250	Sep 0.7329	Oct 0.7408	Nov 0.7461	Dec 0.7513 (40)
HLP (average)	0.7428 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	Jan 98.4511	Feb 94.8710	Mar 91.2910	Apr 87.7110	May 84.1309	Jun 80.5509	Jul 80.5509	Aug 84.1309	Sep 87.7110	Oct 91.2910	Nov 94.8710	Dec 98.4511 (44)
Energy conte	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Energy content (annual)												Total = Sum(45)m = 1408.1991 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (56)													
If cylinder contains dedicated solar storage													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (57)													
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month													
201.2769 177.6201 187.0442 168.3717 165.5050 148.6122 143.4181 156.4202 155.8451 174.5575 183.6979 196.6701 196.6701 (62)													
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
201.2769 177.6201 187.0442 168.3717 165.5050 148.6122 143.4181 156.4202 155.8451 174.5575 183.6979 196.6701 196.6701 (64)													
Total per year (kWh/year) = Sum(64)m =													2059.0388 (64)
Heat gains from water heating, kWh/month													
92.7665 82.3997 88.0341 80.9919 80.8723 74.4219 73.5284 77.8516 76.8268 83.8823 86.0878 91.2347 91.2347 (65)													

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)													
(66)m 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 (66)													
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
18.3088 16.2617 13.2249 10.0121 7.4842 6.3185 6.8273 8.8744 11.9112 15.1240 17.6520 18.8177 18.8177 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
205.3693 207.5004 202.1301 190.6974 176.2657 162.7019 153.6405 151.5094 156.8797 168.3123 182.7441 196.3078 196.3078 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 (69)													
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													
-93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 (71)													
Water heating gains (Table 5)													
124.6861 122.6187 118.3254 112.4887 108.6993 103.3637 98.8285 104.6393 106.7039 112.7450 119.5664 122.6273 122.6273 (72)													
Total internal gains													
406.2912 404.3077 391.6074 371.1252 350.3761 330.3110 317.2233 322.9500 333.4217 354.1083 377.8894 395.6798 395.6798 (73)													

6. Solar gains

[Jan]													
Area m2													
Solar flux Table 6a W/m2													
Specific data or Table 6b													
Specific data or Table 6c													
Access factor Table 6d													
Gains W													
North 1.9700 10.6334 0.4000 0.8000 0.7700 4.6454 (74)													
Northeast 9.3500 11.2829 0.4000 0.8000 0.7700 23.3947 (75)													
Southeast 6.2400 36.7938 0.4000 0.8000 0.7700 50.9147 (77)													
South 2.2100 46.7521 0.4000 0.8000 0.7700 22.9127 (78)													
Solar gains	101.8674	180.7497	267.3455	366.1880	443.0248	454.5378	432.0793	372.3330	301.1023	205.0893	123.3106	86.3489	86.3489 (83)
Total gains	508.1586	585.0574	658.9529	737.3132	793.4010	784.8488	749.3025	695.2830	634.5240	559.1976	501.2000	482.0287	482.0287 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)													
tau 91.1534 91.4691 91.7870 93.4104 93.7420 95.4359 95.4359 95.7820 94.7510 93.7420 93.0811 92.4296 92.4296 (86)													
alpha 7.0769 7.0979 7.1191 7.2274 7.2495 7.3624 7.3624 7.3855 7.3167 7.2495 7.2054 7.1620 7.1620 (86)													
util living area 0.9939 0.9829 0.9462 0.8257 0.6293 0.4357 0.3141 0.3526 0.5810 0.8843 0.9828 0.9956 0.9956 (86)													
MIT 20.4085 20.5549 20.7481 20.9275 20.9900 20.9994 21.0000 20.9999 20.9957 20.9008 20.6279 20.3828 20.3828 (87)													
Th 2 20.2865 20.2888 20.2911 20.3026 20.3049 20.3165 20.3165 20.3188 20.3118 20.3049 20.3003 20.2957 20.2957 (88)													
util rest of house 0.9921 0.9781 0.9326 0.7935 0.5853 0.3894 0.2653 0.3004 0.5252 0.8526 0.9771 0.9943 0.9943 (89)													
MIT 2 19.4987 19.7113 19.9836 20.2254 20.2963 20.3161 20.3165 20.3187 20.3089 20.2002 19.8271 19.4689 19.4689 (90)													
Living area fraction fLA = Living area / (4) =													
MIT 19.8333 20.0216 20.2648 20.4837 20.5514 20.5674 20.5678 20.5693 20.5615 20.4579 20.1217 19.8050 19.8050 (92)													
Temperature adjustment													
adjusted MIT 19.8333 20.0216 20.2648 20.4837 20.5514 20.5674 20.5678 20.5693 20.5615 20.4579 20.1217 19.8050 19.8050 (93)													

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.9906 0.9760 0.9320 0.8022 0.6011 0.4064 0.2833 0.3196 0.5456 0.8602 0.9754 0.9931 0.9931 (94)													
Useful gains	503.3943	571.0204	614.1598	591.4907	476.8897	318.9883	212.2543	222.2048	346.2103	481.0006	488.8805	478.6925	478.6925 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	4.2000 (96)
Heat loss rate W													
870.0310 844.0458 765.6507 633.1314 482.0830 319.2402 212.2684 222.2380 348.1693 536.8993 714.2454 861.9785 861.9785 (97)													
Month fracti 1.0000 1.0000 1.0000 1.0000 1.0000 0.0000 0.0000 0.0000 0.0000 1.0000 1.0000 1.0000 1.0000 (97a)													
Space heating kWh													
272.7777 183.4730 112.7093 29.9813 3.8638 0.0000 0.0000 0.0000 0.0000 41.5886 162.2628 285.1648 285.1648 (98)													
Space heating													
Space heating per m2													
(98) / (4) =													14.8507 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1091.8213 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1223.9316 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	64.4175 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2059.0388 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2308.1825 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	121.4833 (310b)
Electricity used for heat distribution	37.1801 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	170.9800 (330a)
Total electricity for the above, kWh/year	170.9800 (331)
Electricity for lighting (calculated in Appendix L)	323.3395 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	4212.3344 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1412.8457	0.5190	733.2669 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	187.7785	0.5190	97.4571 (368)
Electrical energy for heat distribution	37.1801	0.5190	19.2965 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			850.0205 (373)
Space and water heating			850.0205 (376)
Pumps and fans	170.9800	0.5190	88.7386 (378)
Energy for lighting	323.3395	0.5190	167.8132 (379)
Energy saving/generation technologies			
PV Unit	-221.9000	0.5190	-115.1661 (380)
Total CO2, kg/year			991.4062 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			13.4800 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			13.4800 ZC1
Total Floor Area		TFA	73.5200
Assumed number of occupants		N	2.3285
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.5530 ZC2
CO2 emissions from cooking, equation (L16)			2.3787 ZC3
Total CO2 emissions			32.4117 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			32.4117 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1632 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4132 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3512 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4478	0.4390	0.4303	0.3864	0.3776	0.3337	0.3337	0.3249	0.3512	0.3776	0.3951	0.4127 (22b)
	0.6003	0.5964	0.5926	0.5746	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			16.4900	1.3258	21.8617			(27)					
External Wall	49.6500	16.4900	33.1600	0.1800	5.9688			(29a)					
Corridor	5.4000	1.8900	3.5100	0.1800	0.6318			(29a)					
Total net area of external elements Aum(A, m2)			55.0500					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.3523			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								6.8038 (36)					
Total fabric heat loss						(33) + (36) =		37.1561 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 36.4091	Feb 36.1729	Mar 35.9414	Apr 34.8541	May 34.6506	Jun 33.7036	Jul 33.7036	Aug 33.5282	Sep 34.0684	Oct 34.6506	Nov 35.0622	Dec 35.4924	(38)
Heat transfer coeff	73.5652	73.3290	73.0976	72.0102	71.8068	70.8597	70.8597	70.6844	71.2245	71.8068	72.2183	72.6486	(39)
Average = Sum(39)m / 12 =												72.0092	(39)
HLP	Jan 1.0006	Feb 0.9974	Mar 0.9943	Apr 0.9795	May 0.9767	Jun 0.9638	Jul 0.9638	Aug 0.9614	Sep 0.9688	Oct 0.9767	Nov 0.9823	Dec 0.9881	(40)
HLP (average)												0.9795	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy conte	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Energy content (annual)										Total = Sum(45)m =		1408.1991 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
	85.8210	76.1264	81.0886	74.2704	73.9268	67.7004	66.5829	70.9061	70.1053	76.9367	79.3664	84.2892 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3070	16.2601	13.2236	10.0111	7.4834	6.3178	6.8266	8.8735	11.9100	15.1225	17.6502	18.8158	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	(71)
Water heating gains (Table 5)	115.3508	113.2833	108.9900	103.1533	99.3640	94.0283	89.4931	95.3039	97.3685	103.4096	110.2311	113.2919	(72)
Total internal gains	399.9539	397.9707	385.2706	364.7888	344.0400	323.9750	310.8872	316.6137	327.0851	347.7714	371.5522	389.3425	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g		FF		Access		Gains
						Specific data or Table 6b		Specific data or Table 6c		factor Table 6d		W
North				1.6400	10.6334	0.6300		0.7000		0.7700		5.3295 (74)
Northeast				7.8000	11.2829	0.6300		0.7000		0.7700		26.8961 (75)
Southeast				5.2100	36.7938	0.6300		0.7000		0.7700		58.5847 (77)
South				1.8400	46.7521	0.6300		0.7000		0.7700		26.2900 (78)

Solar gains	117.1003	207.7804	307.3298	420.9574	509.2861	522.5203	496.7031	428.0215	346.1363	235.7610	141.7505	99.2609 (83)
Total gains	517.0543	605.7511	692.6005	785.7462	853.3261	846.4953	807.5903	744.6353	673.2214	583.5324	513.3027	488.6034 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.4018	69.6253	69.8458	70.9004	71.1013	72.0516	72.0516	72.2303	71.6826	71.1013	70.6961	70.2774	
alpha	5.6268	5.6417	5.6564	5.7267	5.7401	5.8034	5.8034	5.8154	5.7788	5.7401	5.7131	5.6852	
util living area	0.9955	0.9886	0.9668	0.8916	0.7311	0.5290	0.3851	0.4347	0.6937	0.9345	0.9893	0.9967	(86)
MIT	20.0627	20.2356	20.4869	20.7749	20.9420	20.9925	20.9990	20.9980	20.9677	20.7343	20.3464	20.0345	(87)
Th 2	20.0828	20.0855	20.0881	20.1005	20.1028	20.1136	20.1136	20.1156	20.1094	20.1028	20.0981	20.0932	(88)
util rest of house	0.9941	0.9850	0.9567	0.8622	0.6757	0.4587	0.3081	0.3522	0.6181	0.9095	0.9853	0.9956	(89)
MIT 2	18.8383	19.0908	19.4514	19.8513	20.0511	20.1090	20.1132	20.1148	20.0863	19.8098	19.2626	18.8052	(90)
Living area fraction	19.2886	19.5119	19.8322	20.1910	20.3788	20.4339	20.4390	20.4397	20.4105	20.1498	19.6612	19.2573	(92)
Temperature adjustment	19.2886	19.5119	19.8322	20.1910	20.3788	20.4339	20.4390	20.4397	20.4105	20.1498	19.6612	19.2573	(93)
adjusted MIT	19.2886	19.5119	19.8322	20.1910	20.3788	20.4339	20.4390	20.4397	20.4105	20.1498	19.6612	19.2573	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9925	0.9822	0.9533	0.8655	0.6935	0.4844	0.3364	0.3826	0.6447	0.9110	0.9828	0.9943	(94)
Ext temp.	513.1554	594.9614	660.2356	680.0534	591.7424	410.0613	271.7045	284.8721	433.9977	531.5940	504.4973	485.8236	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1102.6431	1071.4748	974.5544	813.0649	623.1941	413.3898	272.0310	285.5411	449.4632	685.7406	907.1498	1093.8932	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	438.5788	320.2170	233.8531	95.7682	23.4001	0.0000	0.0000	0.0000	0.0000	114.6851	289.9098	452.4038	(98)
Space heating per m2												1968.8160	(98)
												26.7793	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2105.6855 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	438.5788	320.2170	233.8531	95.7682	23.4001	0.0000	0.0000	0.0000	0.0000	114.6851	289.9098	452.4038	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	469.0682	342.4781	250.1103	102.4259	25.0269	0.0000	0.0000	0.0000	0.0000	122.6578	310.0639	483.8543	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882	(64)
Efficiency of water heater (217)m	86.9428	86.4821	85.5373	83.4968	81.0441	79.8000	79.8000	79.8000	79.8000	83.8526	86.1474	87.0727	(216)
Fuel for water heating, kWh/month	221.5193	196.3161	208.5198	191.5879	193.5033	175.7022	168.8423	185.1357	184.7660	197.8181	203.4839	215.8979	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													2105.6855 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													75.0000 (231)
Electricity for lighting (calculated in Appendix L)													323.3067 (232)
Total delivered energy for all uses													4847.0848 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2105.6855	0.2160	454.8281 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2343.0925	0.2160	506.1080 (264)
Space and water heating			960.9361 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	323.3067	0.5190	167.7962 (268)
Total CO2, kg/m2/year			1167.6573 (272)
Emissions per m2 for space and water heating			13.0704 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.2823 (272b)
Emissions per m2 for pumps and fans			0.5294 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.0704 * 1.55) + 2.2823 + 0.5294, rounded to 2 d.p.			23.0700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010529				Issued on Date	29/04/2022
Assessment Reference	059		Prop Type Ref			
Property						
SAP Rating	84 B	DER	13.25	TER	23.69	
Environmental	91 B	% DER<TER	44.07			
CO ₂ Emissions (t/year)	0.59	DFEE	28.59	TFEE	30.75	
General Requirements Compliance	Fail	% DFEE<TFEE	7.05			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 23.69 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.25 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 30.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 28.6 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing South East: 6.24 m², No overhang
Windows facing South: 2.21 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 221.90 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating		secondary heating		other		total		m3 per hour			
Number of chimneys	0	+	0	+	0	=	0 * 40 =		0.0000 (6a)			
Number of open flues	0	+	0	+	0	=	0 * 20 =		0.0000 (6b)			
Number of intermittent fans							0 * 10 =		0.0000 (7a)			
Number of passive vents							0 * 10 =		0.0000 (7b)			
Number of flueless gas fires							0 * 40 =		0.0000 (7c)			
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =		0.0000 (8)			
Pressure test									Yes			
Measured/design AP50									3.0000			
Infiltration rate									0.1500 (18)			
Number of sides sheltered									3 (19)			
Shelter factor							(20) = 1 - [0.075 x (19)] =		0.7750 (20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =		0.1163 (21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)					
External Wall	19.8500	8.4500	11.4000	0.1500	1.7100		(29a)					
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)					
Total net area of external elements Aum(A, m2)			37.3500				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		17.1781		(33)					
Party Wall 1			37.0000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.3010 (36)					
Total fabric heat loss							(33) + (36) = 22.4791 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 11.1341	Feb 11.0123	Mar 10.8905	Apr 10.2816	May 10.1599	Jun 9.5510	Jul 9.5510	Aug 9.4292	Sep 9.7945	Oct 10.1599	Nov 10.4034	Dec 10.6470 (38)
Heat transfer coeff	33.6132	33.4914	33.3696	32.7607	32.6389	32.0301	32.0301	31.9083	32.2736	32.6389	32.8825	33.1260 (39)
Average = Sum(39)m / 12 =	32.7303 (39)											
HLP	Jan 0.6618	Feb 0.6594	Mar 0.6570	Apr 0.6450	May 0.6426	Jun 0.6306	Jul 0.6306	Aug 0.6282	Sep 0.6354	Oct 0.6426	Nov 0.6474	Dec 0.6522 (40)
HLP (average)	0.6444 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan 82.3820	Feb 79.3863	Mar 76.3906	Apr 73.3949	May 70.3992	Jun 67.4035	Jul 67.4035	Aug 70.3992	Sep 73.3949	Oct 76.3906	Nov 79.3863	Dec 82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												

store volume													110.0000	(47)
b) If manufacturer declared loss factor is not known :														
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152	(51)
Volume factor from Table 2a													1.0294	(52)
Temperature factor from Table 2b													0.6000	(53)
Enter (49) or (54) in (55)													1.0327	(55)
Total storage loss														
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)	
If cylinder contains dedicated solar storage														
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)	
Total heat required for water heating calculated for each month														
	177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(62)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)	
								Solar input (sum of months) =	Sum (63)m =			0.0000	(63)	
Output from w/h														
	177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(64)	
								Total per year (kWh/year) =	Sum (64)m =			1829.1942	(64)	
Heat gains from water heating, kWh/month														
	84.8430	75.4698	80.8830	74.7574	74.8902	69.2597	68.7450	72.3625	71.2721	77.4089	79.0216	83.5613	(65)	

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.4839	11.9763	9.7398	7.3736	5.5119	4.6534	5.0281	6.5357	8.7723	11.1384	13.0002	13.8587 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	114.0363	112.3063	108.7138	103.8297	100.6589	96.1941	92.3992	97.2615	98.9891	104.0442	109.7522	112.3135 (72)
Total internal gains	325.5065	323.8179	314.0852	298.5244	283.0012	267.8182	257.8112	262.6320	270.4999	286.2317	304.2921	317.5716 (73)

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
Southeast					6.2400	36.7938	0.4000	0.8000	0.7700	50.9147		
South					2.2100	46.7521	0.4000	0.8000	0.7700	22.9127 (77)		
Solar gains	73.8274	124.2516	166.4633	201.0539	220.9821	217.6723	210.5612	195.8614	178.4200	136.3256	88.1434	63.3710 (83)
Total gains	399.3338	448.0695	480.5485	499.5783	503.9832	485.4906	468.3724	458.4934	448.9198	422.5573	392.4355	380.9426 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	104.9316	105.3132	105.6975	107.6620	108.0637	110.1179	110.1179	110.5382	109.2869	108.0637	107.2633	106.4746
alpha	7.9954	8.0209	8.0465	8.1775	8.2042	8.3412	8.3412	8.3692	8.2858	8.2042	8.1509	8.0983
util living area	0.9801	0.9528	0.8925	0.7654	0.5985	0.4221	0.3009	0.3201	0.4953	0.7731	0.9457	0.9849 (86)
MIT	20.6551	20.7720	20.8883	20.9714	20.9961	20.9998	21.0000	21.0000	20.9993	20.9740	20.8251	20.6313 (87)
Th 2	20.3747	20.3768	20.3790	20.3896	20.3918	20.4025	20.4025	20.4047	20.3982	20.3918	20.3875	20.3832 (88)
util rest of house	0.9751	0.9424	0.8724	0.7336	0.5607	0.3827	0.2600	0.2787	0.4524	0.7361	0.9322	0.9810 (89)
MIT 2	19.9260	20.0911	20.2483	20.3601	20.3885	20.4024	20.4025	20.4046	20.3977	20.3663	20.1755	19.8996 (90)
Living area fraction									fLA = Living area / (4) =			0.5025 (91)
MIT	20.2923	20.4332	20.5699	20.6673	20.6938	20.7026	20.7027	20.7038	20.7000	20.6717	20.5019	20.2672 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2923	20.4332	20.5699	20.6673	20.6938	20.7026	20.7027	20.7038	20.7000	20.6717	20.5019	20.2672 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9743	0.9434	0.8788	0.7483	0.5796	0.4025	0.2806	0.2995	0.4740	0.7535	0.9349	0.9801 (94)
Useful gains	389.0906	422.7138	422.3265	373.8561	292.0836	195.4067	131.4079	137.3222	212.7735	318.4011	366.9023	373.3650 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	537.5533	520.2289	469.5056	385.5045	293.5476	195.4658	131.4102	137.3262	213.0061	328.7281	440.6885	532.2430 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	110.4563	65.5301	35.1012	8.3869	1.0892	0.0000	0.0000	0.0000	0.0000	7.6833	53.1261	118.2052 (98)
Space heating												399.5783 (98)
Space heating per m2												(98) / (4) = 7.8673 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	399.5783 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	447.9273 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	23.5751 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2050.5266 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	107.9225 (310b)
Electricity used for heat distribution	26.2995 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	238.1302 (332)
Energy saving/generation technologies (Appendices M, N and Q)	
Total delivered energy for all uses	2990.0730 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	999.3816	0.5190	518.6790 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	132.8258	0.5190	68.9366 (368)
Electrical energy for heat distribution	26.2995	0.5190	13.6494 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			601.2651 (373)
Space and water heating			601.2651 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	238.1302	0.5190	123.5896 (379)
Energy saving/generation technologies			
PV Unit	-221.9000	0.5190	-115.1661 (380)
Total CO2, kg/year			673.0020 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			13.2500 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		13.2500 ZC1
Total Floor Area	TFA	50.7900
Assumed number of occupants	N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.4175 ZC2
CO2 emissions from cooking, equation (L16)		3.1526 ZC3
Total CO2 emissions		33.8201 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		33.8201 ZC8

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 20.0000 / (5) = 0.1575 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4075 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
Effective ac	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027			(27)					
External Wall	19.8500	8.4500	11.4000	0.1800	2.0520			(29a)					
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098			(29a)					
Total net area of external elements Aum(A, m2)			37.3500					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =			17.9545		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								3.9726 (36)					
Total fabric heat loss						(33) + (36) =	21.9271	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 24.3480	Feb 24.2160	Mar 24.0867	Apr 23.4794	May 23.3658	Jun 22.8368	Jul 22.8368	Aug 22.7389	Sep 23.0406	Oct 23.3658	Nov 23.5957	Dec 23.8360	(38)
Heat transfer coeff	46.2750	46.1431	46.0138	45.4065	45.2928	44.7639	44.7639	44.6659	44.9676	45.2928	45.5227	45.7630	(39)
Average = Sum(39)m / 12 =												45.4059	(39)
HLP	Jan 0.9111	Feb 0.9085	Mar 0.9060	Apr 0.8940	May 0.8918	Jun 0.8814	Jul 0.8814	Aug 0.8794	Sep 0.8854	Oct 0.8918	Nov 0.8963	Dec 0.9010	(40)
HLP (average)												0.8940	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan 82.3820	Feb 79.3863	Mar 76.3906	Apr 73.3949	May 70.3992	Jun 67.4035	Jul 67.4035	Aug 70.3992	Sep 73.3949	Oct 76.3906	Nov 79.3863	Dec 82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

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If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Southeast				6.2400	36.7938	0.6300	0.7000	0.7700	70.1668 (77)						
South				2.2100	46.7521	0.6300	0.7000	0.7700	31.5766 (78)						
Solar gains				101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains				421.2115	488.9806	537.3716	569.4289	581.3281	561.5651	541.7662	526.3621	510.2428	468.0154	419.7157	398.8747 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.2201	76.4380	76.6527	77.6780	77.8729	78.7931	78.7931	78.9659	78.4360	77.8729	77.4796	77.0728	
alpha	6.0813	6.0959	6.1102	6.1785	6.1915	6.2529	6.2529	6.2644	6.2291	6.1915	6.1653	6.1382	
util living area	0.9885	0.9719	0.9340	0.8448	0.6945	0.5064	0.3631	0.3897	0.5970	0.8637	0.9717	0.9913	(86)
MIT	20.3109	20.4822	20.6801	20.8674	20.9660	20.9959	20.9996	20.9993	20.9890	20.8704	20.5639	20.2768	(87)
Th 2	20.1581	20.1603	20.1624	20.1726	20.1745	20.1834	20.1834	20.1850	20.1800	20.1745	20.1707	20.1666	(88)
util rest of house	0.9851	0.9642	0.9172	0.8109	0.6422	0.4435	0.2960	0.3210	0.5307	0.8261	0.9627	0.9888	(89)
MIT 2	19.2552	19.5011	19.7776	20.0303	20.1446	20.1809	20.1832	20.1848	20.1725	20.0408	19.6284	19.2126	(90)
Living area fraction	19.7857	19.9941	20.2311	20.4509	20.5573	20.5904	20.5934	20.5940	20.5828	20.4576	20.0985	19.7473	(92)
Temperature adjustment	19.7857	19.9941	20.2311	20.4509	20.5573	20.5904	20.5934	20.5940	20.5828	20.4576	20.0985	19.7473	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	414.1906	470.6253	493.6878	468.6099	387.7337	266.7692	178.6433	187.1444	287.6236	393.0711	403.6655	393.7698	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	716.5988	696.4889	631.8178	524.4873	401.1745	268.1535	178.7602	187.3311	291.5146	446.4798	591.7263	711.4923	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	224.9917	151.7803	102.7687	40.2317	9.9999	0.0000	0.0000	0.0000	0.0000	39.7361	135.4038	236.3855	(98)
Space heating												941.2977	(98)
Space heating per m2												18.5331	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1006.7355 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	224.9917	151.7803	102.7687	40.2317	9.9999	0.0000	0.0000	0.0000	0.0000	39.7361	135.4038	236.3855	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	240.6328	162.3319	109.9130	43.0286	10.6951	0.0000	0.0000	0.0000	0.0000	42.4985	144.8169	252.8187	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	85.5817	84.8643	83.7181	81.9482	80.4390	79.8000	79.8000	79.8000	79.8000	81.8662	84.4721	85.7737	(216)
Fuel for water heating, kWh/month	197.1976	175.4996	187.3614	172.3278	172.5926	156.2471	150.8144	164.4484	163.8315	178.8365	182.3612	192.2618	(219)
Water heating fuel used												2093.7800	(219)
Annual totals kWh/year													
Space heating fuel - main system												1006.7355	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												3418.8918	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1006.7355	0.2160	217.4549 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2093.7800	0.2160	452.2565 (264)
Space and water heating			669.7113 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			834.9486 (272)
Emissions per m2 for space and water heating			13.1859 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.1859 * 1.55) + 2.4870 + 0.7664, rounded to 2 d.p.			23.6900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010530			Issued on Date	29/04/2022
Assessment Reference	060	Prop Type Ref			
Property					
SAP Rating	84 B	DER	13.44	TER	24.01
Environmental	91 B	% DER<TER	44.02		
CO ₂ Emissions (t/year)	0.60	DFEE	29.49	TFEE	31.85
General Requirements Compliance	Fail	% DFEE<TFEE	7.42		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 24.01 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.44 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 31.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 29.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing South East: 6.24 m², No overhang
Windows facing South: 2.21 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 221.90 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							3	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.7750 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1163 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)					
External Wall	23.2500	8.4500	14.8000	0.1500	2.2200		(29a)					
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)					
Total net area of external elements Aum(A, m2)			40.7500				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		17.6881		(33)					
Party Wall 1			33.3000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.5730 (36)					
Total fabric heat loss							(33) + (36) = 23.2611 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 11.1341	Feb 11.0123	Mar 10.8905	Apr 10.2816	May 10.1599	Jun 9.5510	Jul 9.5510	Aug 9.4292	Sep 9.7945	Oct 10.1599	Nov 10.4034	Dec 10.6470 (38)
Heat transfer coeff	34.3952	34.2734	34.1516	33.5427	33.4209	32.8121	32.8121	32.6903	33.0556	33.4209	33.6645	33.9080 (39)
Average = Sum(39)m / 12 =	33.5123 (39)											
HLP	Jan 0.6772	Feb 0.6748	Mar 0.6724	Apr 0.6604	May 0.6580	Jun 0.6460	Jul 0.6460	Aug 0.6436	Sep 0.6508	Oct 0.6580	Nov 0.6628	Dec 0.6676 (40)
HLP (average)	0.6598 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan 82.3820	Feb 79.3863	Mar 76.3906	Apr 73.3949	May 70.3992	Jun 67.4035	Jul 67.4035	Aug 70.3992	Sep 73.3949	Oct 76.3906	Nov 79.3863	Dec 82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (56)													
If cylinder contains dedicated solar storage													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (57)													
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month													
177.4469 156.7782 165.5372 149.6214 147.5136 133.0871 129.0318 139.9117 139.1394 155.0886 162.4461 173.5921 173.5921 (62)													
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
177.4469 156.7782 165.5372 149.6214 147.5136 133.0871 129.0318 139.9117 139.1394 155.0886 162.4461 173.5921 173.5921 (64)													
Total per year (kWh/year) = Sum(64)m =													1829.1942 (64)
Heat gains from water heating, kWh/month													
84.8430 75.4698 80.8830 74.7574 74.8902 69.2597 68.7450 72.3625 71.2721 77.4089 79.0216 83.5613 83.5613 (65)													

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
13.4839 11.9763 9.7398 7.3736 5.5119 4.6534 5.0281 6.5357 8.7723 11.1384 13.0002 13.8587 13.8587 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
149.2855 150.8347 146.9309 138.6204 128.1298 118.2701 111.6832 110.1341 114.0378 122.3484 132.8390 142.6987 142.6987 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 (69)													
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													
-68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 (71)													
Water heating gains (Table 5)													
114.0363 112.3063 108.7138 103.8297 100.6589 96.1941 92.3992 97.2615 98.9891 104.0442 109.7522 112.3135 112.3135 (72)													
Total internal gains	325.5065	323.8179	314.0852	298.5244	283.0012	267.8182	257.8112	262.6320	270.4999	286.2317	304.2921	317.5716	317.5716 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W	
Southeast					6.2400	36.7938	0.4000	0.8000			0.7700	50.9147 (77)	
South					2.2100	46.7521	0.4000	0.8000			0.7700	22.9127 (78)	
Solar gains	73.8274	124.2516	166.4633	201.0539	220.9821	217.6723	210.5612	195.8614	178.4200	136.3256	88.1434	63.3710 (83)	
Total gains	399.3338	448.0695	480.5485	499.5783	503.9832	485.4906	468.3724	458.4934	448.9198	422.5573	392.4355	380.9426 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
tau	102.5459	102.9103	103.2773	105.1520	105.5351	107.4935	107.4935	107.8940	106.7015	105.5351	104.7716	104.0191	104.0191
alpha	7.8364	7.8607	7.8852	8.0101	8.0357	8.1662	8.1662	8.1929	8.1134	8.0357	7.9848	7.9346	7.9346
util living area	0.9816	0.9566	0.9003	0.7783	0.6118	0.4323	0.3082	0.3280	0.5070	0.7859	0.9502	0.9860	0.9860 (86)
MIT	20.6309	20.7506	20.8733	20.9654	20.9950	20.9997	21.0000	21.0000	20.9991	20.9685	20.8071	20.6066	20.6066 (87)
Th 2	20.3610	20.3631	20.3653	20.3759	20.3781	20.3887	20.3887	20.3909	20.3845	20.3781	20.3738	20.3695	20.3695 (88)
util rest of house	0.9769	0.9466	0.8808	0.7463	0.5726	0.3911	0.2654	0.2845	0.4623	0.7487	0.9373	0.9823	0.9823 (89)
MIT 2	19.8800	20.0494	20.2162	20.3399	20.3737	20.3886	20.3887	20.3909	20.3838	20.3471	20.1389	19.8527	19.8527 (90)
Living area fraction									fLA = Living area / (4) =			0.5025	0.5025 (91)
MIT	20.2573	20.4017	20.5464	20.6542	20.6859	20.6957	20.6959	20.6969	20.6930	20.6593	20.4747	20.2315	20.2315 (92)
Temperature adjustment												0.0000	0.0000
adjusted MIT	20.2573	20.4017	20.5464	20.6542	20.6859	20.6957	20.6959	20.6969	20.6930	20.6593	20.4747	20.2315	20.2315 (93)

8. Space heating requirement

Utilisation	0.9760	0.9473	0.8867	0.7609	0.5921	0.4118	0.2869	0.3064	0.4848	0.7660	0.9396	0.9814	0.9814 (94)
Useful gains	389.7582	424.4592	426.0892	380.1139	298.4043	199.9271	134.3903	140.4617	217.6151	323.6626	368.7183	373.8613	373.8613 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	4.2000 (96)
Heat loss rate W	548.8541	531.2971	479.7062	394.2683	300.3160	200.0113	134.3938	140.4677	217.9342	336.1928	450.2511	543.5979	543.5979 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	118.3674	71.7952	39.8911	10.1912	1.4223	0.0000	0.0000	0.0000	0.0000	9.3224	58.7036	126.2840	126.2840 (98)
Space heating												435.9771	435.9771 (98)
Space heating per m2												(98) / (4) =	8.5839 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	435.9771 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	488.7303 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	25.7226 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2050.5266 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	107.9225 (310b)
Electricity used for heat distribution	26.7290 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	238.1302 (332)
Energy saving/generation technologies (Appendices M, N and Q)	
Total delivered energy for all uses	3033.0236 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1015.7028	0.5190	527.1497 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	134.9951	0.5190	70.0624 (368)
Electrical energy for heat distribution	26.7290	0.5190	13.8724 (372)
Total CO ₂ associated with community systems (negative value allowed since DFEE <= TFEE)			611.0845 (373)
Space and water heating			611.0845 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	238.1302	0.5190	123.5896 (379)
Energy saving/generation technologies			
PV Unit	-221.9000	0.5190	-115.1661 (380)
Total CO ₂ , kg/year			682.8215 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			13.4400 (384)

16 CO₂ EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			13.4400 ZC1
Total Floor Area		TFA	50.7900
Assumed number of occupants		N	1.7134
CO ₂ emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO ₂ emissions from appliances, equation (L14)			17.4175 ZC2
CO ₂ emissions from cooking, equation (L16)			3.1526 ZC3
Total CO ₂ emissions			34.0101 ZC4
Residual CO ₂ emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m ² /year			0.0000 ZC6
Resulting CO ₂ emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO ₂ emissions			34.0101 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1575 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4075 (18)
					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)
External Wall	23.2500	8.4500	14.8000	0.1800	2.6640		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Total net area of external elements Aum(A, m ²)			40.7500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.5665		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.2380 (36)
Total fabric heat loss						(33) + (36) =	22.8045 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	24.3480	24.2160	24.0867	23.4794	23.3658	22.8368	22.8368
Heat transfer coeff	47.1524	47.0205	46.8912	46.2839	46.1702	45.6413	45.6413
Average = Sum(39)m / 12 =						45.5433	45.5433
	45.8450	46.1702	46.4001	46.6404	46.2833		
HLP	0.9284	0.9258	0.9232	0.9113	0.9090	0.8986	0.8986
HLP (average)						0.8967	0.8967
Days in month	31	28	31	30	31	30	31
						30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Southeast				6.2400	36.7938	0.6300	0.7000	0.7700	70.1668 (77)			
South				2.2100	46.7521	0.6300	0.7000	0.7700	31.5766 (78)			
Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains	421.2115	488.9806	537.3716	569.4289	581.3281	561.5651	541.7662	526.3621	510.2428	468.0154	419.7157	398.8747 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.8018	75.0116	75.2185	76.2055	76.3930	77.2784	77.2784	77.4446	76.9349	76.3930	76.0145	75.6229	
alpha	5.9868	6.0008	6.0146	6.0804	6.0929	6.1519	6.1519	6.1630	6.1290	6.0929	6.0676	6.0415	
util living area	0.9889	0.9730	0.9370	0.8515	0.7041	0.5156	0.3702	0.3972	0.6070	0.8698	0.9729	0.9916	(86)
MIT	20.2853	20.4578	20.6597	20.8547	20.9612	20.9951	20.9995	20.9992	20.9871	20.8586	20.5428	20.2509	(87)
Th 2	20.1434	20.1456	20.1478	20.1579	20.1598	20.1687	20.1687	20.1703	20.1653	20.1598	20.1560	20.1520	(88)
util rest of house	0.9856	0.9656	0.9207	0.8180	0.6511	0.4507	0.3005	0.3260	0.5389	0.8326	0.9642	0.9891	(89)
MIT 2	19.2067	19.4548	19.7375	20.0014	20.1256	20.1656	20.1685	20.1700	20.1564	20.0134	19.5868	19.1638	(90)
Living area fraction	19.7487	19.9588	20.2009	20.4301	20.5455	20.5824	20.5860	20.5866	20.5738	20.4381	20.0671	19.7100	(92)
Temperature adjustment	19.7487	19.9588	20.2009	20.4301	20.5455	20.5824	20.5860	20.5866	20.5738	20.4381	20.0671	19.7100	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	414.3738	471.2466	495.3425	472.3095	393.0051	271.3738	181.7796	190.4392	292.2132	395.8707	404.2268	393.8933	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	728.4418	708.0700	642.4517	533.6598	408.3969	273.0447	181.9264	190.6722	296.7936	454.2273	601.6772	723.3942	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	233.6666	159.1454	109.4492	44.1722	11.4515	0.0000	0.0000	0.0000	0.0000	43.4173	142.1643	245.1486	(98)
Space heating												988.6151	(98)
Space heating per m2												19.4648	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1057.3423 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	233.6666	159.1454	109.4492	44.1722	11.4515	0.0000	0.0000	0.0000	0.0000	43.4173	142.1643	245.1486	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	249.9107	170.2090	117.0580	47.2430	12.2476	0.0000	0.0000	0.0000	0.0000	46.4356	152.0473	262.1911	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	85.6821	84.9908	83.8757	82.1132	80.5255	79.8000	79.8000	79.8000	79.8000	82.0180	84.6007	85.8696	(216)
Fuel for water heating, kWh/month	196.9666	175.2384	187.0092	171.9816	172.4072	156.2471	150.8144	164.4484	163.8315	178.5057	182.0840	192.0473	(219)
Water heating fuel used												2091.5813	(219)
Annual totals kWh/year													
Space heating fuel - main system												1057.3423	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												3467.3000	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1057.3423	0.2160	228.3859 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2091.5813	0.2160	451.7816 (264)
Space and water heating			680.1675 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			845.4048 (272)
Emissions per m2 for space and water heating			13.3918 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.3918 * 1.55) + 2.4870 + 0.7664, rounded to 2 d.p.			24.0100 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010531			Issued on Date	29/04/2022
Assessment Reference	061	Prop Type Ref			
Property					
SAP Rating	84 B	DER	13.44	TER	24.01
Environmental	91 B	% DER<TER	44.02		
CO ₂ Emissions (t/year)	0.60	DFEE	29.49	TFEE	31.85
General Requirements Compliance	Fail	% DFEE<TFEE	7.42		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 24.01 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.44 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 31.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 29.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing South East: 6.24 m², No overhang
Windows facing South: 2.21 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 221.90 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							3	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.7750 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1163 (21)				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)					
External Wall	23.2500	8.4500	14.8000	0.1500	2.2200		(29a)					
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)					
Total net area of external elements Aum(A, m2)				40.7500			(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	17.6881		(33)					
Party Wall 1			33.3000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.5730 (36)					
Total fabric heat loss							(33) + (36) = 23.2611 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 11.1341	Feb 11.0123	Mar 10.8905	Apr 10.2816	May 10.1599	Jun 9.5510	Jul 9.5510	Aug 9.4292	Sep 9.7945	Oct 10.1599	Nov 10.4034	Dec 10.6470 (38)
Heat transfer coeff	34.3952	34.2734	34.1516	33.5427	33.4209	32.8121	32.8121	32.6903	33.0556	33.4209	33.6645	33.9080 (39)
Average = Sum(39)m / 12 =	33.5123 (39)											
HLP	Jan 0.6772	Feb 0.6748	Mar 0.6724	Apr 0.6604	May 0.6580	Jun 0.6460	Jul 0.6460	Aug 0.6436	Sep 0.6508	Oct 0.6580	Nov 0.6628	Dec 0.6676 (40)
HLP (average)	0.6598 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan 82.3820	Feb 79.3863	Mar 76.3906	Apr 73.3949	May 70.3992	Jun 67.4035	Jul 67.4035	Aug 70.3992	Sep 73.3949	Oct 76.3906	Nov 79.3863	Dec 82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												

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Calculation Type: New Build (As Designed)

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Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (56)													
If cylinder contains dedicated solar storage													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (57)													
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month													
177.4469 156.7782 165.5372 149.6214 147.5136 133.0871 129.0318 139.9117 139.1394 155.0886 162.4461 173.5921 173.5921 (62)													
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
177.4469 156.7782 165.5372 149.6214 147.5136 133.0871 129.0318 139.9117 139.1394 155.0886 162.4461 173.5921 173.5921 (64)													
Total per year (kWh/year) = Sum(64)m =													1829.1942 (64)
Heat gains from water heating, kWh/month													
84.8430 75.4698 80.8830 74.7574 74.8902 69.2597 68.7450 72.3625 71.2721 77.4089 79.0216 83.5613 83.5613 (65)													

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
13.4839 11.9763 9.7398 7.3736 5.5119 4.6534 5.0281 6.5357 8.7723 11.1384 13.0002 13.8587 13.8587 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
149.2855 150.8347 146.9309 138.6204 128.1298 118.2701 111.6832 110.1341 114.0378 122.3484 132.8390 142.6987 142.6987 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 (69)													
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													
-68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 (71)													
Water heating gains (Table 5)													
114.0363 112.3063 108.7138 103.8297 100.6589 96.1941 92.3992 97.2615 98.9891 104.0442 109.7522 112.3135 112.3135 (72)													
Total internal gains	325.5065	323.8179	314.0852	298.5244	283.0012	267.8182	257.8112	262.6320	270.4999	286.2317	304.2921	317.5716	317.5716 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W	
Southeast					6.2400	36.7938	0.4000	0.8000			0.7700	50.9147 (77)	
South					2.2100	46.7521	0.4000	0.8000			0.7700	22.9127 (78)	
Solar gains	73.8274	124.2516	166.4633	201.0539	220.9821	217.6723	210.5612	195.8614	178.4200	136.3256	88.1434	63.3710 (83)	
Total gains	399.3338	448.0695	480.5485	499.5783	503.9832	485.4906	468.3724	458.4934	448.9198	422.5573	392.4355	380.9426 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
tau	102.5459	102.9103	103.2773	105.1520	105.5351	107.4935	107.4935	107.8940	106.7015	105.5351	104.7716	104.0191	104.0191
alpha	7.8364	7.8607	7.8852	8.0101	8.0357	8.1662	8.1662	8.1929	8.1134	8.0357	7.9848	7.9346	7.9346
util living area	0.9816	0.9566	0.9003	0.7783	0.6118	0.4323	0.3082	0.3280	0.5070	0.7859	0.9502	0.9860	0.9860 (86)
MIT	20.6309	20.7506	20.8733	20.9654	20.9950	20.9997	21.0000	21.0000	20.9991	20.9685	20.8071	20.6066	20.6066 (87)
Th 2	20.3610	20.3631	20.3653	20.3759	20.3781	20.3887	20.3887	20.3909	20.3845	20.3781	20.3738	20.3695	20.3695 (88)
util rest of house	0.9769	0.9466	0.8808	0.7463	0.5726	0.3911	0.2654	0.2845	0.4623	0.7487	0.9373	0.9823	0.9823 (89)
MIT 2	19.8800	20.0494	20.2162	20.3399	20.3737	20.3886	20.3887	20.3909	20.3838	20.3471	20.1389	19.8527	19.8527 (90)
Living area fraction									fLA = Living area / (4) =			0.5025	0.5025 (91)
MIT	20.2573	20.4017	20.5464	20.6542	20.6859	20.6957	20.6959	20.6969	20.6930	20.6593	20.4747	20.2315	20.2315 (92)
Temperature adjustment												0.0000	0.0000
adjusted MIT	20.2573	20.4017	20.5464	20.6542	20.6859	20.6957	20.6959	20.6969	20.6930	20.6593	20.4747	20.2315	20.2315 (93)

8. Space heating requirement

Utilisation	0.9760	0.9473	0.8867	0.7609	0.5921	0.4118	0.2869	0.3064	0.4848	0.7660	0.9396	0.9814	0.9814 (94)
Useful gains	389.7582	424.4592	426.0892	380.1139	298.4043	199.9271	134.3903	140.4617	217.6151	323.6626	368.7183	373.8613	373.8613 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	4.2000 (96)
Heat loss rate W	548.8541	531.2971	479.7062	394.2683	300.3160	200.0113	134.3938	140.4677	217.9342	336.1928	450.2511	543.5979	543.5979 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	118.3674	71.7952	39.8911	10.1912	1.4223	0.0000	0.0000	0.0000	0.0000	9.3224	58.7036	126.2840	126.2840 (98)
Space heating												435.9771	435.9771 (98)
Space heating per m2												(98) / (4) =	8.5839 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	435.9771 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	488.7303 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	25.7226 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2050.5266 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	107.9225 (310b)
Electricity used for heat distribution	26.7290 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	238.1302 (332)
Energy saving/generation technologies (Appendices M, N and Q)	
Total delivered energy for all uses	3033.0236 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			250.0000 (367a)	
Space heating from Heat pump	1015.7028	0.5190	527.1497 (367)	
Efficiency of heat source Boilers			99.0000 (367b)	
Space heating from Boilers	134.9951	0.5190	70.0624 (368)	
Electrical energy for heat distribution	26.7290	0.5190	13.8724 (372)	
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			611.0845 (373)	
Space and water heating			611.0845 (376)	
Pumps and fans	121.9912	0.5190	63.3134 (378)	
Energy for lighting	238.1302	0.5190	123.5896 (379)	
Energy saving/generation technologies				
PV Unit	-221.9000	0.5190	-115.1661 (380)	
Total CO2, kg/year			682.8215 (383)	
Dwelling Carbon Dioxide Emission Rate (DER)			13.4400 (384)	

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			13.4400 ZC1
Total Floor Area		TFA	50.7900
Assumed number of occupants		N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			17.4175 ZC2
CO2 emissions from cooking, equation (L16)			3.1526 ZC3
Total CO2 emissions			34.0101 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			34.0101 ZC8

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1575 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4075 (18)
					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)
External Wall	23.2500	8.4500	14.8000	0.1800	2.6640		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Total net area of external elements Aum(A, m ²)			40.7500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	18.5665	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.2380 (36)
Total fabric heat loss						(33) + (36) =	22.8045 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	24.3480	24.2160	24.0867	23.4794	23.3658	22.8368	22.8368
Heat transfer coeff	47.1524	47.0205	46.8912	46.2839	46.1702	45.6413	45.6413
Average = Sum(39)m / 12 =							
HLP	0.9284	0.9258	0.9232	0.9113	0.9090	0.8986	0.8986
HLP (average)							
Days in month	31	28	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

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If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Southeast				6.2400	36.7938	0.6300	0.7000	0.7700	70.1668 (77)			
South				2.2100	46.7521	0.6300	0.7000	0.7700	31.5766 (78)			
Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains	421.2115	488.9806	537.3716	569.4289	581.3281	561.5651	541.7662	526.3621	510.2428	468.0154	419.7157	398.8747 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.8018	75.0116	75.2185	76.2055	76.3930	77.2784	77.2784	77.4446	76.9349	76.3930	76.0145	75.6229	
alpha	5.9868	6.0008	6.0146	6.0804	6.0929	6.1519	6.1519	6.1630	6.1290	6.0929	6.0676	6.0415	
util living area	0.9889	0.9730	0.9370	0.8515	0.7041	0.5156	0.3702	0.3972	0.6070	0.8698	0.9729	0.9916	(86)
MIT	20.2853	20.4578	20.6597	20.8547	20.9612	20.9951	20.9995	20.9992	20.9871	20.8586	20.5428	20.2509	(87)
Th 2	20.1434	20.1456	20.1478	20.1579	20.1598	20.1687	20.1687	20.1703	20.1653	20.1598	20.1560	20.1520	(88)
util rest of house	0.9856	0.9656	0.9207	0.8180	0.6511	0.4507	0.3005	0.3260	0.5389	0.8326	0.9642	0.9891	(89)
MIT 2	19.2067	19.4548	19.7375	20.0014	20.1256	20.1656	20.1685	20.1700	20.1564	20.0134	19.5868	19.1638	(90)
Living area fraction	19.7487	19.9588	20.2009	20.4301	20.5455	20.5824	20.5860	20.5866	20.5738	20.4381	20.0671	19.7100	(92)
Temperature adjustment	19.7487	19.9588	20.2009	20.4301	20.5455	20.5824	20.5860	20.5866	20.5738	20.4381	20.0671	19.7100	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	414.3738	471.2466	495.3425	472.3095	393.0051	271.3738	181.7796	190.4392	292.2132	395.8707	404.2268	393.8933	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	728.4418	708.0700	642.4517	533.6598	408.3969	273.0447	181.9264	190.6722	296.7936	454.2273	601.6772	723.3942	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	233.6666	159.1454	109.4492	44.1722	11.4515	0.0000	0.0000	0.0000	0.0000	43.4173	142.1643	245.1486	(98)
Space heating												988.6151	(98)
Space heating per m2												19.4648	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1057.3423 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	233.6666	159.1454	109.4492	44.1722	11.4515	0.0000	0.0000	0.0000	0.0000	43.4173	142.1643	245.1486	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	249.9107	170.2090	117.0580	47.2430	12.2476	0.0000	0.0000	0.0000	0.0000	46.4356	152.0473	262.1911	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	85.6821	84.9908	83.8757	82.1132	80.5255	79.8000	79.8000	79.8000	79.8000	82.0180	84.6007	85.8696	(216)
Fuel for water heating, kWh/month	196.9666	175.2384	187.0092	171.9816	172.4072	156.2471	150.8144	164.4484	163.8315	178.5057	182.0840	192.0473	(219)
Water heating fuel used												2091.5813	(219)
Annual totals kWh/year													
Space heating fuel - main system												1057.3423	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												3467.3000	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1057.3423	0.2160	228.3859 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2091.5813	0.2160	451.7816 (264)
Space and water heating			680.1675 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			845.4048 (272)
Emissions per m2 for space and water heating			13.3918 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.3918 * 1.55) + 2.4870 + 0.7664, rounded to 2 d.p.			24.0100 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010532			Issued on Date	29/04/2022
Assessment Reference	062	Prop Type Ref			
Property					
SAP Rating	85 B	DER	12.62	TER	21.82
Environmental	91 B	% DER<TER	42.15		
CO ₂ Emissions (t/year)	0.78	DFEE	31.04	TFEE	35.49
General Requirements Compliance	Fail	% DFEE<TFEE	12.55		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aecom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 74 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 21.82 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.62 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 35.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 31.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading: Average
Windows facing South East: 6.24 m², No overhang
Windows facing South: 2.21 m², No overhang
Windows facing South West: 6.47 m², No overhang
Windows facing West: 1.97 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 221.90 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							2	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1275 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			16.8900	1.1450	19.3397		(27)					
External Wall	52.9300	16.8900	36.0400	0.1500	5.4060		(29a)					
Corridor	5.4000	1.8900	3.5100	0.2500	0.8775		(29a)					
Total net area of external elements Aum(A, m2)			58.3300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	27.5132		(33)					
Party Wall 1			34.6500	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.9400 (36)					
Total fabric heat loss							(33) + (36) = 36.4532 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 17.2447	Feb 17.0514	Mar 16.8580	Apr 15.8913	May 15.6980	Jun 14.7313	Jul 14.7313	Aug 14.5380	Sep 15.1180	Oct 15.6980	Nov 16.0847	Dec 16.4714 (38)
Heat transfer coeff	53.6979	53.5046	53.3112	52.3445	52.1512	51.1845	51.1845	50.9912	51.5712	52.1512	52.5379	52.9245 (39)
Average = Sum(39)m / 12 =	52.2962 (39)											
HLP	Jan 0.7304	Feb 0.7278	Mar 0.7251	Apr 0.7120	May 0.7093	Jun 0.6962	Jul 0.6962	Aug 0.6936	Sep 0.7015	Oct 0.7093	Nov 0.7146	Dec 0.7199 (40)
HLP (average)	0.7113 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	Jan 98.4511	Feb 94.8710	Mar 91.2910	Apr 87.7110	May 84.1309	Jun 80.5509	Jul 80.5509	Aug 84.1309	Sep 87.7110	Oct 91.2910	Nov 94.8710	Dec 98.4511 (44)
Energy conte	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Energy content (annual)												Total = Sum(45)m = 1408.1991 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	(56)
If cylinder contains dedicated solar storage													
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	(59)
Total heat required for water heating calculated for each month													
201.2769	177.6201	187.0442	168.3717	165.5050	148.6122	143.4181	156.4202	155.8451	174.5575	183.6979	196.6701	196.6701	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
201.2769	177.6201	187.0442	168.3717	165.5050	148.6122	143.4181	156.4202	155.8451	174.5575	183.6979	196.6701	196.6701	(64)
Heat gains from water heating, kWh/month													
92.7665	82.3997	88.0341	80.9919	80.8723	74.4219	73.5284	77.8516	76.8268	83.8823	86.0878	91.2347	91.2347	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
18.3088	16.2617	13.2249	10.0121	7.4842	6.3185	6.8273	8.8744	11.9112	15.1240	17.6520	18.8177	18.8177	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078	196.3078	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	(71)
Water heating gains (Table 5)													
124.6861	122.6187	118.3254	112.4887	108.6993	103.3637	98.8285	104.6393	106.7039	112.7450	119.5664	122.6273	122.6273	(72)
Total internal gains													
406.2912	404.3077	391.6074	371.1252	350.3761	330.3110	317.2233	322.9500	333.4217	354.1083	377.8894	395.6798	395.6798	(73)

6. Solar gains

[Jan]				Area	Solar flux	g		FF	Access		Gains	
				m2	Table 6a	or Table 6b		Specific data	Specific data	factor	W	
					W/m2			or Table 6c	or Table 6c	Table 6d		
Southeast				6.2400	36.7938	0.4000		0.8000		0.7700	50.9147 (77)	
South				2.2100	46.7521	0.4000		0.8000		0.7700	22.9127 (78)	
Southwest				6.4700	36.7938	0.4000		0.8000		0.7700	52.7913 (79)	
West				1.9700	19.6403	0.4000		0.8000		0.7700	8.5802 (80)	
Solar gains	135.1989	230.9594	317.1420	393.8166	441.1436	437.7689	422.1475	387.0003	343.7915	255.6263	162.0737	115.6053 (83)
Total gains	541.4900	635.2671	708.7494	764.9418	791.5197	768.0799	739.3708	709.9503	677.2132	609.7345	539.9631	511.2851 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	95.0793	95.4228	95.7689	97.5375	97.8991	99.7480	99.7480	100.1262	99.0001	97.8991	97.1786	96.4686
alpha	7.3386	7.3615	7.3846	7.5025	7.5266	7.6499	7.6499	7.6751	7.6000	7.5266	7.4786	7.4312
util living area	0.9901	0.9697	0.9153	0.7847	0.6067	0.4261	0.3046	0.3303	0.5236	0.8250	0.9705	0.9930 (86)
MIT	20.5012	20.6604	20.8279	20.9541	20.9934	20.9996	21.0000	21.0000	20.9982	20.9454	20.7138	20.4713 (87)
Th 2	20.3141	20.3164	20.3187	20.3303	20.3326	20.3442	20.3442	20.3465	20.3395	20.3326	20.3279	20.3233 (88)
util rest of house	0.9873	0.9621	0.8970	0.7514	0.5652	0.3826	0.2592	0.2834	0.4743	0.7881	0.9617	0.9910 (89)
MIT 2	19.6551	19.8834	20.1141	20.2824	20.3269	20.3440	20.3442	20.3465	20.3383	20.2776	19.9709	19.6196 (90)
Living area fraction												
MIT	19.9663	20.1692	20.3766	20.5294	20.5720	20.5851	20.5854	20.5868	20.5810	20.5232	20.2442	19.9329 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9663	20.1692	20.3766	20.5294	20.5720	20.5851	20.5854	20.5868	20.5810	20.5232	20.2442	19.9329 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9856	0.9602	0.8987	0.7616	0.5802	0.3986	0.2759	0.3007	0.4924	0.7991	0.9604	0.9895	(94)
Useful gains	533.6830	610.0093	636.9698	582.5865	459.2720	306.1818	203.9819	213.4770	333.4428	487.2537	518.6047	505.9342	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
841.2451	816.9694	739.7784	608.7372	462.6861	306.3445	203.9897	213.4917	334.2351	517.5058	690.5667	832.6546	832.6546	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
228.8262	139.0771	76.4896	18.8285	2.5400	0.0000	0.0000	0.0000	0.0000	0.0000	22.5076	123.8126	243.0800	(98)
Space heating													855.1617 (98)
Space heating per m2													11.6317 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	855.1617 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	958.6362 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	50.4545 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2059.0388 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2308.1825 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	121.4833 (310b)
Electricity used for heat distribution	34.3876 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	170.9800 (330a)
Total electricity for the above, kWh/year	170.9800 (331)
Electricity for lighting (calculated in Appendix L)	323.3395 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	3933.0761 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1306.7275	0.5190	678.1916 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	173.6746	0.5190	90.1371 (368)
Electrical energy for heat distribution	34.3876	0.5190	17.8471 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			786.1758 (373)
Space and water heating			786.1758 (376)
Pumps and fans	170.9800	0.5190	88.7386 (378)
Energy for lighting	323.3395	0.5190	167.8132 (379)
Energy saving/generation technologies			
PV Unit	-221.9000	0.5190	-115.1661 (380)
Total CO2, kg/year			927.5615 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			12.6200 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			12.6200 ZC1
Total Floor Area		TFA	73.5200
Assumed number of occupants		N	2.3285
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.5530 ZC2
CO2 emissions from cooking, equation (L16)			2.3787 ZC3
Total CO2 emissions			31.5517 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			31.5517 ZC8

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1632 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4132 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3512 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4478	0.4390	0.4303	0.3864	0.3776	0.3337	0.3337	0.3249	0.3512	0.3776	0.3951	0.4127 (22b)
	0.6003	0.5964	0.5926	0.5746	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			16.4900	1.3258	21.8617		(27)					
External Wall	52.9300	16.4900	36.4400	0.1800	6.5592		(29a)					
Corridor	5.4000	1.8900	3.5100	0.1800	0.6318		(29a)					
Total net area of external elements Aum(A, m2)			58.3300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.9427		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.8612 (36)					
Total fabric heat loss						(33) + (36) =	37.8039 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 36.4091	Feb 36.1729	Mar 35.9414	Apr 34.8541	May 34.6506	Jun 33.7036	Jul 33.7036	Aug 33.5282	Sep 34.0684	Oct 34.6506	Nov 35.0622	Dec 35.4924 (38)
Heat transfer coeff	74.2130	73.9768	73.7454	72.6580	72.4546	71.5075	71.5075	71.3322	71.8723	72.4546	72.8661	73.2964 (39)
Average = Sum(39)m / 12 =												72.6570 (39)
HLP	Jan 1.0094	Feb 1.0062	Mar 1.0031	Apr 0.9883	May 0.9855	Jun 0.9726	Jul 0.9726	Aug 0.9702	Sep 0.9776	Oct 0.9855	Nov 0.9911	Dec 0.9970 (40)
HLP (average)												0.9883 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy conte	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Energy content (annual)										Total = Sum(45)m =		1408.1991 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

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If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
	85.8210	76.1264	81.0886	74.2704	73.9268	67.7004	66.5829	70.9061	70.1053	76.9367	79.3664	84.2892 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3070	16.2601	13.2236	10.0111	7.4834	6.3178	6.8266	8.8735	11.9100	15.1225	17.6502	18.8158	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	(71)
Water heating gains (Table 5)	115.3508	113.2833	108.9900	103.1533	99.3640	94.0283	89.4931	95.3039	97.3685	103.4096	110.2311	113.2919	(72)
Total internal gains	399.9539	397.9707	385.2706	364.7888	344.0400	323.9750	310.8872	316.6137	327.0851	347.7714	371.5522	389.3425	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g	Specific data or Table 6b	FF	Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast				6.0900	36.7938		0.6300		0.7000	0.7700	68.4801 (77)	
South				2.1600	46.7521		0.6300		0.7000	0.7700	30.8622 (78)	
Southwest				6.3200	36.7938		0.6300		0.7000	0.7700	71.0663 (79)	
West				1.9200	19.6403		0.6300		0.7000	0.7700	11.5245 (80)	
Solar gains	181.9330	310.7877	426.7420	529.8924	593.5562	589.0095	567.9937	520.7143	462.5933	343.9756	218.0963	155.5675 (83)
Total gains	581.8870	708.7584	812.0126	894.6812	937.5962	912.9845	878.8809	837.3280	789.6784	691.7470	589.6485	544.9100 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.7960	69.0156	69.2322	70.2683	70.4656	71.3988	71.3988	71.5744	71.0365	70.4656	70.0676	69.6563	
alpha	5.5864	5.6010	5.6155	5.6846	5.6977	5.7599	5.7599	5.7716	5.7358	5.6977	5.6712	5.6438	
util living area	0.9922	0.9771	0.9388	0.8429	0.6841	0.4965	0.3574	0.3908	0.6111	0.8845	0.9800	0.9944	(86)
MIT	20.1321	20.3461	20.5971	20.8354	20.9573	20.9943	20.9993	20.9988	20.9824	20.8135	20.4278	20.0939	(87)
Th 2	20.0755	20.0782	20.0808	20.0931	20.0954	20.1062	20.1062	20.1082	20.1021	20.0954	20.0908	20.0859	(88)
util rest of house	0.9898	0.9706	0.9223	0.8070	0.6283	0.4293	0.2851	0.3156	0.5384	0.8484	0.9731	0.9926	(89)
MIT 2	18.9334	19.2425	19.5953	19.9172	20.0584	20.1028	20.1060	20.1078	20.0901	19.9004	19.3725	18.8859	(90)
Living area fraction	19.3743	19.6484	19.9637	20.2549	20.3890	20.4307	20.4345	20.4355	20.4182	20.2362	19.7606	19.3302	(91)
MIT	19.3743	19.6484	19.9637	20.2549	20.3890	20.4307	20.4345	20.4355	20.4182	20.2362	19.7606	19.3302	(92)
Temperature adjustment	19.3743	19.6484	19.9637	20.2549	20.3890	20.4307	20.4345	20.4355	20.4182	20.2362	19.7606	19.3302	(93)
adjusted MIT	19.3743	19.6484	19.9637	20.2549	20.3890	20.4307	20.4345	20.4355	20.4182	20.2362	19.7606	19.3302	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9874	0.9668	0.9199	0.8139	0.6470	0.4539	0.3117	0.3433	0.5646	0.8546	0.9700	0.9907	(94)
Ext temp.	574.5418	685.2257	747.0076	728.1608	606.5812	414.4448	273.9663	287.4611	445.8306	591.1723	571.9475	539.8407	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1118.7057	1091.0408	992.8858	825.0249	629.5572	416.9375	274.1965	287.8594	454.1064	698.1865	922.5305	1108.9889	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	404.8580	272.7078	182.9334	69.7421	17.0941	0.0000	0.0000	0.0000	0.0000	79.6186	252.4197	423.4462	(98)
Space heating per m2												1702.8199	(98)
										(98) / (4) =		23.1613	(99)

8c. Space cooling requirement

Not applicable

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1821.1977 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	404.8580	272.7078	182.9334	69.7421	17.0941	0.0000	0.0000	0.0000	0.0000	79.6186	252.4197	423.4462	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	433.0032	291.6660	195.6507	74.5905	18.2825	0.0000	0.0000	0.0000	0.0000	85.1536	269.9676	452.8836	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882	(64)
Efficiency of water heater (217)m	86.7503	86.0718	84.8813	82.7712	80.7383	79.8000	79.8000	79.8000	79.8000	82.9819	85.7857	86.9168	(216)
Fuel for water heating, kWh/month	222.0107	197.2519	210.1313	193.2676	194.2364	175.7022	168.8423	185.1357	184.7660	199.8936	204.3417	216.2851	(219)
Water heating fuel used												2351.8646	(219)
Annual totals kWh/year													
Space heating fuel - main system												1821.1977	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												323.3067	(232)
Total delivered energy for all uses												4571.3691	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1821.1977	0.2160	393.3787 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2351.8646	0.2160	508.0028 (264)
Space and water heating			901.3815 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	323.3067	0.5190	167.7962 (268)
Total CO2, kg/m2/year			1108.1027 (272)
Emissions per m2 for space and water heating			12.2604 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.2823 (272b)
Emissions per m2 for pumps and fans			0.5294 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.2604 * 1.55) + 2.2823 + 0.5294, rounded to 2 d.p.			21.8200 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010533				Issued on Date	29/04/2022
Assessment Reference	084			Prop Type Ref		
Property						
SAP Rating	83 B	DER	16.28	TER	27.37	
Environmental	88 B	% DER<TER	40.51			
CO ₂ Emissions (t/year)	0.95	DFEE	45.83	TFEE	53.07	
General Requirements Compliance	Pass	% DFEE<TFEE	13.64			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 27.37 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.28 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)53.1 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)45.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.61	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing West:	5.93 m ² , No overhang
Windows facing North West:	7.10 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	221.90 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							2	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1275 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			13.0300	1.1450	14.9198		(27)					
External Wall	35.0800	13.0300	22.0500	0.1500	3.3075		(29a)					
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)					
Core	18.2300		18.2300	0.2500	4.5575		(29a)					
Main Roof	72.7700		72.7700	0.1000	7.2770		(30)					
Total net area of external elements Aum(A, m2)			143.5800				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	35.8543		(33)					
Party Wall 1			18.3000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												
								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								10.2164 (36)				
Total fabric heat loss								(33) + (36) = 46.0707 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 17.0688	Feb 16.8774	Mar 16.6860	Apr 15.7292	May 15.5379	Jun 14.5811	Jul 14.5811	Aug 14.3897	Sep 14.9638	Oct 15.5379	Nov 15.9206	Dec 16.3033 (38)
Heat transfer coeff	63.1395	62.9482	62.7568	61.8000	61.6086	60.6518	60.6518	60.4604	61.0345	61.6086	61.9913	62.3741 (39)
Average = Sum(39)m / 12 =												61.7521 (39)
HLP	Jan 0.8677	Feb 0.8650	Mar 0.8624	Apr 0.8493	May 0.8466	Jun 0.8335	Jul 0.8335	Aug 0.8308	Sep 0.8387	Oct 0.8466	Nov 0.8519	Dec 0.8571 (40)
HLP (average)												0.8486 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	Jan 98.0067	Feb 94.4428	Mar 90.8789	Apr 87.3151	May 83.7512	Jun 80.1873	Jul 80.1873	Aug 83.7512	Sep 87.3151	Oct 90.8789	Nov 94.4428	Dec 98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)												Total = Sum(45)m = 1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)
Water storage loss:												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(64)
Heat gains from water heating, kWh/month												
92.5474	82.2081	87.8363	80.8195	80.7069	74.2791	73.3961	77.6998	76.6732	83.7032	85.8924	91.0225	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
18.2451	16.2051	13.1789	9.9773	7.4581	6.2965	6.8035	8.8435	11.8697	15.0713	17.5905	18.7521	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	(71)
Water heating gains (Table 5)												
124.3916	122.3335	118.0596	112.2492	108.4770	103.1654	98.6507	104.4353	106.4905	112.5044	119.2950	122.3421	(72)
Total internal gains												
403.9823	401.9977	389.3716	369.0214	348.4174	328.4923	315.4981	321.2091	331.6165	352.1703	375.7927	393.4532	(73)

6. Solar gains

[Jan]			Area	Solar flux	g	FF	Access	Gains				
			m2	Table 6a	Specific data	Specific data	factor	W				
				W/m2	or Table 6b	or Table 6c	Table 6d					
West			5.9300	19.6403	0.4000	0.8000	0.7700	25.8277 (80)				
Northwest			7.1000	11.2829	0.4000	0.8000	0.7700	17.7649 (81)				
Solar gains	43.5926	86.6855	148.3572	228.3479	292.5450	305.5740	288.3795	238.8530	176.1598	104.1431	54.5570	35.7472 (83)
Total gains	447.5749	488.6831	537.7288	597.3693	640.9623	634.0663	603.8776	560.0621	507.7763	456.3135	430.3497	429.2004 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.0366	80.2799	80.5247	81.7714	82.0254	83.3194	83.3194	83.5831	82.7969	82.0254	81.5190	81.0188	
alpha	6.3358	6.3520	6.3683	6.4514	6.4684	6.5546	6.5546	6.5722	6.5198	6.4684	6.4346	6.4013	
util living area	0.9975	0.9949	0.9853	0.9419	0.8130	0.6024	0.4408	0.4941	0.7740	0.9652	0.9942	0.9980 (86)	
MIT	20.1728	20.2823	20.4823	20.7472	20.9291	20.9915	20.9990	20.9981	20.9616	20.7264	20.4080	20.1554 (87)	
Th 2	20.1951	20.1973	20.1996	20.2109	20.2131	20.2244	20.2244	20.2267	20.2199	20.2131	20.2086	20.2041 (88)	
util rest of house	0.9967	0.9933	0.9805	0.9235	0.7659	0.5337	0.3637	0.4124	0.7064	0.9504	0.9921	0.9974 (89)	
MIT 2	19.0841	19.2453	19.5364	19.9162	20.1460	20.2189	20.2240	20.2259	20.1902	19.8959	19.4377	19.0656 (90)	
Living area fraction									fLA = Living area / (4) =				0.3848 (91)
MIT	19.5030	19.6443	19.9003	20.2360	20.4473	20.5162	20.5222	20.5230	20.4870	20.2154	19.8110	19.4850 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.5030	19.6443	19.9003	20.2360	20.4473	20.5162	20.5222	20.5230	20.4870	20.2154	19.8110	19.4850 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9957	0.9919	0.9783	0.9242	0.7807	0.5600	0.3934	0.4439	0.7308	0.9505	0.9906	0.9967 (94)
Useful gains	445.6679	484.7140	526.0565	552.0783	500.4239	355.0461	237.5692	248.5994	371.1031	433.7197	426.3197	427.7704 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
	959.9096	928.1261	840.9616	700.5624	538.9104	358.8285	237.8909	249.2776	389.8277	592.3935	787.9737	953.3848 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
	382.5959	297.9729	234.2894	106.9086	28.6340	0.0000	0.0000	0.0000	0.0000	118.0533	260.3909	391.0571 (98)
Space heating												1819.9020 (98)
Space heating per m2										(98) / (4) =		25.0090 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1819.9020 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	2040.1102 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	107.3742 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2052.6825 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2301.0570 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	121.1083 (310b)
Electricity used for heat distribution	45.6965 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	169.2357 (330a)
Total electricity for the above, kWh/year	169.2357 (331)
Electricity for lighting (calculated in Appendix L)	322.2135 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	5061.0989 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1736.4669	0.5190	901.2263 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	230.7904	0.5190	119.7802 (368)
Electrical energy for heat distribution	45.6965	0.5190	23.7165 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1044.7230 (373)
Space and water heating			1044.7230 (376)
Pumps and fans	169.2357	0.5190	87.8333 (378)
Energy for lighting	322.2135	0.5190	167.2288 (379)
Energy saving/generation technologies			
PV Unit	-221.9000	0.5190	-115.1661 (380)
Total CO2, kg/year			1184.6190 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			16.2800 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			16.2800 ZC1
Total Floor Area		TFA	72.7700
Assumed number of occupants		N	2.3115
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.5855 ZC2
CO2 emissions from cooking, equation (L16)			2.3976 ZC3
Total CO2 emissions			35.2631 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			35.2631 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					30.0000 / (5) = 0.1649 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4149 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3527 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4497	0.4408	0.4320	0.3879	0.3791	0.3350	0.3350	0.3262	0.3527	0.3791	0.3968	0.4144 (22b)
	0.6011	0.5972	0.5933	0.5752	0.5719	0.5561	0.5561	0.5532	0.5622	0.5719	0.5787	0.5859 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900			(26)				
TER Opening Type (Uw = 1.40)			13.0300	1.3258	17.2746			(27)				
External Wall	35.0800	13.0300	22.0500	0.1800	3.9690			(29a)				
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098			(29a)				
Core	18.2300		18.2300	0.1800	3.2814			(29a)				
Main Roof	72.7700		72.7700	0.1300	9.4601			(30)				
Total net area of external elements Aum(A, m2)			143.5800					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	38.6849			(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								8.0954 (36)				
Total fabric heat loss						(33) + (36) =		46.7803 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 36.0868	Feb 35.8511	Mar 35.6201	Apr 34.5351	May 34.3321	Jun 33.3870	Jul 33.3870	Aug 33.2120	Sep 33.7511	Oct 34.3321	Nov 34.7427	Dec 35.1721 (38)
Heat transfer coeff	82.8671	82.6314	82.4004	81.3154	81.1124	80.1674	80.1674	79.9924	80.5314	81.1124	81.5231	81.9524 (39)
Average = Sum(39)m / 12 =												81.3144 (39)
HLP	Jan 1.1388	Feb 1.1355	Mar 1.1323	Apr 1.1174	May 1.1146	Jun 1.1017	Jul 1.1017	Aug 1.0992	Sep 1.1067	Oct 1.1146	Nov 1.1203	Dec 1.1262 (40)
HLP (average)												1.1174 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)										Total = Sum(45)m =		1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (64)
Heat gains from water heating, kWh/month	85.6018	75.9347	80.8908	74.0980	73.7613	67.5576	66.4506	70.7543	69.9517	76.7577	79.1709	84.0770 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5611	16.4858	13.4072	10.1501	7.5873	6.4055	6.9214	8.9967	12.0753	15.3324	17.8952	19.0770	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	(71)
Water heating gains (Table 5)	115.0562	112.9981	108.7242	102.9139	99.1416	93.8300	89.3153	95.0999	97.1551	103.1690	109.9597	113.0067	(72)
Total internal gains	397.9629	395.9430	383.2645	362.8588	342.2112	322.2660	309.2806	315.0269	325.4868	346.0960	369.7620	387.4427	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
West					5.9300	19.6403	0.6300	0.7000			0.7700			35.5938 (80)
Northwest					7.1000	11.2829	0.6300	0.7000			0.7700			24.4823 (81)
Solar gains	60.0761	119.4634	204.4548	314.6920	403.1636	421.1192	397.4230	329.1693	242.7702	143.5223	75.1863			49.2641 (83)
Total gains	458.0390	515.4064	587.7193	677.5508	745.3747	743.3852	706.7036	644.1963	568.2570	489.6183	444.9483			436.7067 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	60.9829	61.1568	61.3282	62.1466	62.3021	63.0365	63.0365	63.1744	62.7516	62.3021	61.9883	61.6635
alpha	5.0655	5.0771	5.0885	5.1431	5.1535	5.2024	5.2024	5.2116	5.1834	5.1535	5.1326	5.1109
util living area	0.9975	0.9950	0.9861	0.9491	0.8425	0.6557	0.4923	0.5576	0.8287	0.9736	0.9950	0.9981 (86)
MIT	19.8012	19.9421	20.2034	20.5575	20.8358	20.9666	20.9937	20.9885	20.8898	20.5235	20.1041	19.7803 (87)
Th 2	19.9693	19.9719	19.9745	19.9866	19.9889	19.9995	19.9995	20.0014	19.9954	19.9889	19.9843	19.9795 (88)
util rest of house	0.9967	0.9933	0.9811	0.9308	0.7914	0.5672	0.3840	0.4435	0.7548	0.9608	0.9929	0.9974 (89)
MIT 2	18.3746	18.5819	18.9625	19.4717	19.8321	19.9780	19.9972	19.9968	19.9080	19.4350	18.8277	18.3514 (90)
Living area fraction	18.9235	19.1053	19.4399	19.8895	20.2183	20.3584	20.3807	20.3784	20.2858	fLA = Living area / (4) =	19.3188	0.3848 (91)
MIT	18.9235	19.1053	19.4399	19.8895	20.2183	20.3584	20.3807	20.3784	20.2858	19.8538	19.3188	18.9012 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9235	19.1053	19.4399	19.8895	20.2183	20.3584	20.3807	20.3784	20.2858	19.8538	19.3188	18.9012 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	455.9710	510.9480	574.6405	629.2774	599.3967	446.1582	300.9581	314.1101	442.3919	469.3250	440.9855	435.1469	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1211.8061	1173.8001	1066.2558	893.6129	690.9404	461.6363	303.0852	318.2430	498.1498	750.5981	996.1154	1204.7996	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	562.3413	445.4366	365.7618	190.3216	68.1085	0.0000	0.0000	0.0000	0.0000	209.2672	399.6935	572.6216	(98)
Space heating												2813.5522	(98)
Space heating per m ²												38.6636	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3009.1467 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	562.3413	445.4366	365.7618	190.3216	68.1085	0.0000	0.0000	0.0000	0.0000	209.2672	399.6935	572.6216	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	601.4346	476.4028	391.1891	203.5525	72.8434	0.0000	0.0000	0.0000	0.0000	223.8152	427.4797	612.4296	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500	(64)
Efficiency of water heater (217)m	87.5140	87.2784	86.6979	85.2868	82.7697	79.8000	79.8000	79.8000	79.8000	85.4434	86.9538	87.6042	(216)
Fuel for water heating, kWh/month	219.3202	193.8647	205.0423	186.9589	188.8679	175.1642	168.3438	184.5636	184.1870	193.5049	200.9209	213.8595	(219)
Water heating fuel used												2314.5980	(219)
Annual totals kWh/year													
Space heating fuel - main system												3009.1467	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												327.7949	(232)
Total delivered energy for all uses												5726.5396	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3009.1467	0.2160	649.9757 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2314.5980	0.2160	499.9532 (264)
Space and water heating			1149.9289 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	327.7949	0.5190	170.1255 (268)
Total CO2, kg/m2/year			1358.9794 (272)
Emissions per m2 for space and water heating			15.8022 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3379 (272b)
Emissions per m2 for pumps and fans			0.5349 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.8022 * 1.55) + 2.3379 + 0.5349, rounded to 2 d.p.			27.3700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010534	Issued on Date	29/04/2022
Assessment Reference	089	Prop Type Ref	
Property			
SAP Rating	83 B	DER	15.63
Environmental	90 B	TER	27.16
CO ₂ Emissions (t/year)	0.66	% DER<TER	42.45
General Requirements Compliance	Pass	DFEE	38.77
		TFEE	42.55
		% DFEE<TFEE	8.89
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 27.16 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.63 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 42.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 38.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.63
Maximum 1.5 OK
MVHR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK
Based on:
Overshading: Average
Windows facing South East: 6.24 m², No overhang
Windows facing South: 2.21 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 221.90 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)
External Wall	23.2500	8.4500	14.8000	0.1500	2.2200		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Main Roof	50.7900		50.7900	0.1000	5.0790		(30)
Total net area of external elements Aum(A, m ²)			91.5400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.7671		(33)
Party Wall 1			33.3000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.4438 (36)
Total fabric heat loss							(33) + (36) = 31.2109 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	11.1341	11.0123	10.8905	10.2816	10.1599	9.5510	9.5510	9.4292	9.7945	10.1599	10.4034	10.6470 (38)
Average = Sum(39)m / 12 =	42.3450	42.2232	42.1014	41.4925	41.3707	40.7619	40.7619	40.6401	41.0054	41.3707	41.6143	41.8578 (39)
												41.4621 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8337	0.8313	0.8289	0.8169	0.8145	0.8026	0.8026	0.8002	0.8074	0.8145	0.8193	0.8241 (40)
Days in month												0.8163 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy content (annual)	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1178.3544 (45)
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
	Solar input (sum of months) = Sum (63)m =											0.0000 (63)	
Output from w/h													
	177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(64)
	Total per year (kWh/year) = Sum (64)m =											1829.1942 (64)	
Heat gains from water heating, kWh/month													
	84.8430	75.4698	80.8830	74.7574	74.8902	69.2597	68.7450	72.3625	71.2721	77.4089	79.0216	83.5613	(65)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	847.4861 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	950.0319 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	50.0017 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2050.5266 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	107.9225 (310b)
Electricity used for heat distribution	31.5848 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	238.1302 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	3518.6042 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1200.2234	0.5190	622.9160 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	159.5193	0.5190	82.7905 (368)
Electrical energy for heat distribution	31.5848	0.5190	16.3925 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			722.0990 (373)
Space and water heating			722.0990 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	238.1302	0.5190	123.5896 (379)
Energy saving/generation technologies			
PV Unit	-221.9000	0.5190	-115.1661 (380)
Total CO2, kg/year			793.8360 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.6300 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		15.6300 ZC1
Total Floor Area	TFA	50.7900
Assumed number of occupants	N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.4175 ZC2
CO2 emissions from cooking, equation (L16)		3.1526 ZC3
Total CO2 emissions		36.2001 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		36.2001 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 20.0000 / (5) = 0.1575 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4075 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
Effective ac	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)
External Wall	23.2500	8.4500	14.8000	0.1800	2.6640		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Main Roof	50.7900		50.7900	0.1300	6.6027		(30)
Total net area of external elements Aum(A, m ²)			91.5400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	25.1692	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.9994 (36)
Total fabric heat loss						(33) + (36) =	31.1686 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	24.3480	24.2160	24.0867	23.4794	23.3658	22.8368	22.8368	22.7389	23.0406	23.3658	23.5957	23.8360 (38)
Heat transfer coeff	55.5165	55.3846	55.2553	54.6480	54.5343	54.0054	54.0054	53.9074	54.2091	54.5343	54.7642	55.0045 (39)
Average = Sum(39)m / 12 =												54.6474 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0931	1.0905	1.0879	1.0760	1.0737	1.0633	1.0633	1.0614	1.0673	1.0737	1.0782	1.0830 (40)
HLP (average)												1.0759 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
Heat gains from water heating, kWh/month	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415	(73)

6. Solar gains

[Jan]			Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				
Southeast			6.2400	36.7938	0.6300	0.7000	0.7700	70.1668 (77)				
South			2.2100	46.7521	0.6300	0.7000	0.7700	31.5766 (78)				
Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains	421.2115	488.9806	537.3716	569.4289	581.3281	561.5651	541.7662	526.3621	510.2428	468.0154	419.7157	398.8747 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	63.5322	63.6835	63.8325	64.5419	64.6764	65.3098	65.3098	65.4285	65.0644	64.6764	64.4049	64.1235	
alpha	5.2355	5.2456	5.2555	5.3028	5.3118	5.3540	5.3540	5.3619	5.3376	5.3118	5.2937	5.2749	
util living area	0.9912	0.9802	0.9560	0.8970	0.7791	0.5970	0.4356	0.4667	0.6897	0.9103	0.9803	0.9932	(86)
MIT	20.0478	20.2291	20.4624	20.7180	20.8982	20.9805	20.9969	20.9956	20.9585	20.7354	20.3447	20.0118	(87)
Th 2	20.0065	20.0086	20.0107	20.0205	20.0224	20.0309	20.0309	20.0325	20.0276	20.0224	20.0186	20.0148	(88)
util rest of house	0.9884	0.9743	0.9429	0.8674	0.7226	0.5145	0.3413	0.3709	0.6089	0.8781	0.9734	0.9911	(89)
MIT 2	18.7596	19.0219	19.3537	19.7081	19.9295	20.0188	20.0298	20.0308	19.9983	19.7398	19.1983	18.7136	(90)
Living area fraction	19.4068	19.6285	19.9108	20.2155	20.4162	20.5020	20.5158	20.5156	20.4808	20.2401	19.7743	19.3659	(91)
MIT	19.4068	19.6285	19.9108	20.2155	20.4162	20.5020	20.5158	20.5156	20.4808	20.2401	19.7743	19.3659	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4068	19.6285	19.9108	20.2155	20.4162	20.5020	20.5158	20.5156	20.4808	20.2401	19.7743	19.3659	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	415.4360	475.0410	505.8674	497.6151	433.9755	311.9106	210.6332	220.6063	330.6056	414.7359	407.6342	394.5852	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(95)
Heat loss rate W	838.6788	815.7306	741.0165	618.3709	475.3347	318.7419	211.4727	221.8605	345.8954	525.7142	694.0989	834.1923	(96)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	314.8926	228.9434	174.9510	86.9441	30.7713	0.0000	0.0000	0.0000	0.0000	82.5679	206.2546	327.0677	(98)
Space heating												1452.3925	(98)
Space heating per m2												28.5960	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1553.3610 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	314.8926	228.9434	174.9510	86.9441	30.7713	0.0000	0.0000	0.0000	0.0000	82.5679	206.2546	327.0677	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	336.7836	244.8592	187.1133	92.9884	32.9105	0.0000	0.0000	0.0000	0.0000	88.3079	220.5931	349.8050	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	86.4550	85.9573	85.1055	83.5649	81.5493	79.8000	79.8000	79.8000	79.8000	83.3537	85.5932	86.6074	(217)
Fuel for water heating, kWh/month	195.2056	173.2680	184.3070	168.9939	170.2427	156.2471	150.8144	164.4484	163.8315	175.6451	179.9726	190.4111	(219)
Water heating fuel used												2073.3874	(219)
Annual totals kWh/year													
Space heating fuel - main system												1553.3610	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												3945.1247	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1553.3610	0.2160	335.5260 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2073.3874	0.2160	447.8517 (264)
Space and water heating			783.3776 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			948.6150 (272)
Emissions per m2 for space and water heating			15.4239 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.4239 * 1.55) + 2.4870 + 0.7664, rounded to 2 d.p.			27.1600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010535				Issued on Date	29/04/2022
Assessment Reference	090		Prop Type Ref			
Property						
SAP Rating	84 B	DER	14.55	TER	24.70	
Environmental	89 B	% DER<TER	41.09			
CO ₂ Emissions (t/year)	0.87	DFEE	38.88	TFEE	45.08	
General Requirements Compliance	Fail	% DFEE<TFEE	13.77			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 74 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 24.70 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.55 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)45.1 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)38.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.61	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing South East:	6.24 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Windows facing South West:	6.47 m ² , No overhang
Windows facing West:	1.97 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	221.90 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												75.6500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			16.8900	1.1450	19.3397		(27)
External Wall	52.9300	16.8900	36.0400	0.1500	5.4060		(29a)
Corridor	5.4000	1.8900	3.5100	0.2500	0.8775		(29a)
Main Roof	73.5200		73.5200	0.1000	7.3520		(30)
Total net area of external elements Aum(A, m ²)			131.8500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	34.8652		(33)
Party Wall 1			34.6500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.7998 (36)
Total fabric heat loss							(33) + (36) = 46.6650 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	17.2447	17.0514	16.8580	15.8913	15.6980	14.7313	14.7313	14.5380	15.1180	15.6980	16.0847	16.4714 (38)
Heat transfer coeff	63.9097	63.7164	63.5230	62.5563	62.3630	61.3963	61.3963	61.2030	61.7830	62.3630	62.7497	63.1363 (39)
Average = Sum(39)m / 12 =												62.5080 (39)
HLP	0.8693	0.8667	0.8640	0.8509	0.8482	0.8351	0.8351	0.8325	0.8404	0.8482	0.8535	0.8588 (40)
HLP (average)												0.8502 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy content (annual)	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1408.1991 (45)
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1382.5700 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1549.8610 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	81.5716 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2059.0388 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2308.1825 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	121.4833 (310b)
Electricity used for heat distribution	40.6110 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	170.9800 (330a)
Total electricity for the above, kWh/year	170.9800 (331)
Electricity for lighting (calculated in Appendix L)	323.3395 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	4555.4179 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1543.2174	0.5190	800.9298 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	205.1060	0.5190	106.4500 (368)
Electrical energy for heat distribution	40.6110	0.5190	21.0771 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			928.4569 (373)
Space and water heating			928.4569 (376)
Pumps and fans	170.9800	0.5190	88.7386 (378)
Energy for lighting	323.3395	0.5190	167.8132 (379)
Energy saving/generation technologies			
PV Unit	-221.9000	0.5190	-115.1661 (380)
Total CO2, kg/year			1069.8426 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.5500 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		14.5500 ZC1
Total Floor Area	TFA	73.5200
Assumed number of occupants	N	2.3285
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.5530 ZC2
CO2 emissions from cooking, equation (L16)		2.3787 ZC3
Total CO2 emissions		33.4817 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		33.4817 ZC8

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 30.0000 / (5) = 0.1632 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4132 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3512 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4478	0.4390	0.4303	0.3864	0.3776	0.3337	0.3337	0.3249	0.3512	0.3776	0.3951	0.4127 (22b)
	0.6003	0.5964	0.5926	0.5746	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			16.4900	1.3258	21.8617		(27)
External Wall	52.9300	16.4900	36.4400	0.1800	6.5592		(29a)
Corridor	5.4000	1.8900	3.5100	0.1800	0.6318		(29a)
Main Roof	73.5200		73.5200	0.1300	9.5576		(30)
Total net area of external elements Aum(A, m ²)			131.8500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.5003		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.7577 (36)
Total fabric heat loss						(33) + (36) =	49.2580 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.4091	36.1729	35.9414	34.8541	34.6506	33.7036	33.7036	33.5282	34.0684	34.6506	35.0622	35.4924 (38)
Heat transfer coeff	85.6671	85.4309	85.1995	84.1121	83.9087	82.9616	82.9616	82.7863	83.3264	83.9087	84.3202	84.7505 (39)
Average = Sum(39)m / 12 =												84.1111 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1652	1.1620	1.1589	1.1441	1.1413	1.1284	1.1284	1.1260	1.1334	1.1413	1.1469	1.1528 (40)
HLP (average)												1.1441 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy conte	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Energy content (annual)										Total = Sum(45)m =		1408.1991 (45)
Distribution loss (46)m = 0.15 x (45)m	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
Heat gains from water heating, kWh/month	85.8210	76.1264	81.0886	74.2704	73.9268	67.7004	66.5829	70.9061	70.1053	76.9367	79.3664	84.2892 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3070	16.2601	13.2236	10.0111	7.4834	6.3178	6.8266	8.8735	11.9100	15.1225	17.6502	18.8158	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	(71)
Water heating gains (Table 5)	115.3508	113.2833	108.9900	103.1533	99.3640	94.0283	89.4931	95.3039	97.3685	103.4096	110.2311	113.2919	(72)
Total internal gains	399.9539	397.9707	385.2706	364.7888	344.0400	323.9750	310.8872	316.6137	327.0851	347.7714	371.5522	389.3425	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Southeast				6.0900	36.7938	0.6300	0.7000	0.7700	68.4801 (77)			
South				2.1600	46.7521	0.6300	0.7000	0.7700	30.8622 (78)			
Southwest				6.3200	36.7938	0.6300	0.7000	0.7700	71.0663 (79)			
West				1.9200	19.6403	0.6300	0.7000	0.7700	11.5245 (80)			
Solar gains	181.9330	310.7877	426.7420	529.8924	593.5562	589.0095	567.9937	520.7143	462.5933	343.9756	218.0963	155.5675 (83)
Total gains	581.8870	708.7584	812.0126	894.6812	937.5962	912.9845	878.8809	837.3280	789.6784	691.7470	589.6485	544.9100 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.5976	59.7624	59.9247	60.6994	60.8466	61.5412	61.5412	61.6715	61.2717	60.8466	60.5496	60.2422	
alpha	4.9732	4.9842	4.9950	5.0466	5.0564	5.1027	5.1027	5.1114	5.0848	5.0564	5.0366	5.0161	
util living area	0.9932	0.9819	0.9542	0.8834	0.7501	0.5657	0.4126	0.4503	0.6820	0.9152	0.9841	0.9950	(86)
MIT	19.9137	20.1338	20.4126	20.7092	20.9014	20.9814	20.9969	20.9952	20.9533	20.6935	20.2436	19.8744	(87)
Th 2	19.9479	19.9505	19.9531	19.9650	19.9672	19.9777	19.9777	19.9796	19.9737	19.9672	19.9627	19.9580	(88)
util rest of house	0.9910	0.9763	0.9403	0.8506	0.6898	0.4821	0.3182	0.3528	0.5979	0.8833	0.9783	0.9934	(89)
MIT 2	18.5227	18.8419	19.2383	19.6473	19.8794	19.9665	19.9766	19.9778	19.9412	19.6394	19.0122	18.4728	(90)
Living area fraction									fLA = Living area / (4) =			0.3678	(91)
MIT	19.0343	19.3171	19.6702	20.0378	20.2553	20.3397	20.3519	20.3520	20.3135	20.0271	19.4651	18.9883	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0343	19.3171	19.6702	20.0378	20.2553	20.3397	20.3519	20.3520	20.3135	20.0271	19.4651	18.9883	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9884	0.9719	0.9358	0.8532	0.7076	0.5124	0.3530	0.3888	0.6271	0.8854	0.9746	0.9913	(94)
Useful gains	575.1541	688.8759	759.9132	763.3559	663.4653	467.7964	310.2535	325.5330	495.1756	612.5055	574.6539	540.1574	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1262.2479	1231.6626	1122.0926	936.8273	717.8599	476.1781	311.2620	327.1732	517.7464	791.0119	1042.6279	1253.3142	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	511.1978	364.7526	269.4614	124.8994	40.4696	0.0000	0.0000	0.0000	0.0000	132.8088	336.9413	530.5887	(98)
Space heating												2311.1196	(98)
Space heating per m2												(98) / (4) =	31.4353 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												2471.7857 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	511.1978	364.7526	269.4614	124.8994	40.4696	0.0000	0.0000	0.0000	0.0000	132.8088	336.9413	530.5887 (98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000 (210)
Space heating fuel (main heating system)	546.7357	390.1098	288.1941	133.5823	43.2829	0.0000	0.0000	0.0000	0.0000	142.0415	360.3650	567.4745 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
Efficiency of water heater (217)m	87.2968	86.8032	85.9119	84.1629	81.7834	79.8000	79.8000	79.8000	79.8000	84.2280	86.5295	79.8000 (216)
Fuel for water heating, kWh/month	220.6209	195.5900	207.6106	190.0718	191.7541	175.7022	168.8423	185.1357	184.7660	196.9364	202.5853	215.0083 (219)
Water heating fuel used												2334.6235 (219)
Annual totals kWh/year												
Space heating fuel - main system												2471.7857 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												323.3067 (232)
Total delivered energy for all uses												5204.7160 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2471.7857	0.2160	533.9057 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2334.6235	0.2160	504.2787 (264)
Space and water heating			1038.1844 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	323.3067	0.5190	167.7962 (268)
Total CO2, kg/m2/year			1244.9056 (272)
Emissions per m2 for space and water heating			14.1211 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.2823 (272b)
Emissions per m2 for pumps and fans			0.5294 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.1211 * 1.55) + 2.2823 + 0.5294, rounded to 2 d.p.			24.7000 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010536			Issued on Date	29/04/2022
Assessment Reference	094	Prop Type Ref			
Property					
SAP Rating	83 B	DER	14.82	TER	25.80
Environmental	91 B	% DER<TER	42.55		
CO ₂ Emissions (t/year)	0.64	DFEE	35.13	TFEE	38.58
General Requirements Compliance	Fail	% DFEE<TFEE	8.96		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 25.80 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.82 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 38.6 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 35.1 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room stats OK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing South East:	6.24 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Windows facing South West:	1.97 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	221.90 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			10.4200	1.1450	11.9313		(27)
External Wall	39.4300	10.4200	29.0100	0.1500	4.3515		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Total net area of external elements Aum(A, m ²)			56.9300				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	22.0753	(33)
Party Wall 1			17.0500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.2660 (36)
Total fabric heat loss						(33) + (36) =	29.3413 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	11.7351	11.6015	11.4680	10.8002	10.6666	9.9988	9.9988	9.8652	10.2659	10.6666	10.9337	11.2009 (38)
Heat transfer coeff	41.0764	40.9428	40.8093	40.1415	40.0079	39.3401	39.3401	39.2065	39.6072	40.0079	40.2750	40.5422 (39)
Average = Sum(39)m / 12 =												40.1081 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8087	0.8061	0.8035	0.7903	0.7877	0.7746	0.7746	0.7719	0.7798	0.7877	0.7930	0.7982 (40)
HLP (average)												0.7897 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	30.9817	(56)
If cylinder contains dedicated solar storage													
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	30.9817	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	(59)
Total heat required for water heating calculated for each month													
177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	173.5921	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	173.5921	(64)
Heat gains from water heating, kWh/month													
84.8430	75.4698	80.8830	74.7574	74.8902	69.2597	68.7450	72.3625	71.2721	77.4089	79.0216	83.5613	83.5613	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
13.3089	11.8209	9.6134	7.2779	5.4403	4.5930	4.9629	6.4509	8.6584	10.9938	12.8314	13.6788	13.6788	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)													
114.0363	112.3063	108.7138	103.8297	100.6589	96.1941	92.3992	97.2615	98.9891	104.0442	109.7522	112.3135	112.3135	(72)
Total internal gains													
325.3314	323.6625	313.9587	298.4287	282.9297	267.7578	257.7459	262.5472	270.3860	286.0871	304.1233	317.3917	317.3917	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W	
Southeast				6.2400	36.7938	0.4000	0.8000	0.7700			50.9147 (77)	
South				2.2100	46.7521	0.4000	0.8000	0.7700			22.9127 (78)	
Southwest				1.9700	36.7938	0.4000	0.8000	0.7700			16.0740 (79)	
Solar gains	89.9014	151.6316	203.9258	247.4718	272.9739	269.2882	260.3244	241.4662	218.9840	166.5863	107.3964	77.1270 (83)
Total gains	415.2328	475.2941	517.8846	545.9005	555.9036	537.0461	518.0703	504.0134	489.3700	452.6734	411.5197	394.5187 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	85.8664	86.1465	86.4285	87.8663	88.1596	89.6562	89.6562	89.9616	89.0515	88.1596	87.5749	86.9979
alpha	6.7244	6.7431	6.7619	6.8578	6.8773	6.9771	6.9771	6.9974	6.9368	6.8773	6.8383	6.7999
util living area	0.9862	0.9666	0.9214	0.8164	0.6547	0.4676	0.3340	0.3577	0.5541	0.8334	0.9645	0.9896 (86)
MIT	20.4549	20.6059	20.7739	20.9208	20.9839	20.9987	20.9999	20.9998	20.9958	20.9231	20.6778	20.4257 (87)
Th 2	20.2458	20.2480	20.2503	20.2617	20.2640	20.2754	20.2754	20.2777	20.2709	20.2640	20.2594	20.2549 (88)
util rest of house												
	0.9824	0.9581	0.9033	0.7825	0.6077	0.4152	0.2791	0.3016	0.4974	0.7949	0.9541	0.9866 (89)
MIT 2	19.5323	19.7482	19.9805	20.1779	20.2500	20.2746	20.2754	20.2777	20.2680	20.1863	19.8615	19.4977 (90)
Living area fraction										fLA = Living area / (4) =		0.5025 (91)
MIT	19.9959	20.1792	20.3792	20.5512	20.6188	20.6384	20.6394	20.6405	20.6336	20.5565	20.2717	19.9640 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9959	20.1792	20.3792	20.5512	20.6188	20.6384	20.6394	20.6405	20.6336	20.5565	20.2717	19.9640 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9809	0.9572	0.9067	0.7963	0.6306	0.4415	0.3067	0.3298	0.5258	0.8109	0.9543	0.9853	(94)
Useful gains	407.2985	454.9645	469.5542	434.7004	350.5744	237.1038	158.8824	166.2085	257.3025	367.0777	392.6927	388.7040	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	644.7296	625.5726	566.3988	467.6963	356.8217	237.5516	158.9114	166.2560	258.7798	398.3391	530.4891	639.1061	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	176.6487	114.6486	72.0524	23.7571	4.6479	0.0000	0.0000	0.0000	0.0000	23.2585	99.2134	186.2991	(98)
Space heating													700.5259 (98)
Space heating per m2													13.7926 (99)
										(98) / (4) =			

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	700.5259 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	785.2895 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	41.3310 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2050.5266 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	107.9225 (310b)
Electricity used for heat distribution	29.8507 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	235.0396 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	3342.1005 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1134.3265	0.5190	588.7154 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	150.7611	0.5190	78.2450 (368)
Electrical energy for heat distribution	29.8507	0.5190	15.4925 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			682.4530 (373)
Space and water heating			682.4530 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	235.0396	0.5190	121.9856 (379)
Energy saving/generation technologies			
PV Unit	-221.9000	0.5190	-115.1661 (380)
Total CO2, kg/year			752.5859 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.8200 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		14.8200 ZC1
Total Floor Area	TFA	50.7900
Assumed number of occupants	N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.4175 ZC2
CO2 emissions from cooking, equation (L16)		3.1526 ZC3
Total CO2 emissions		35.3901 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		35.3901 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.1575 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4075 (18)
Number of sides sheltered					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3464 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4416	0.4330	0.4243	0.3810	0.3724	0.3291	0.3291	0.3204	0.3464	0.3724	0.3897	0.4070 (22b)
Effective ac	0.5975	0.5937	0.5900	0.5726	0.5693	0.5541	0.5541	0.5513	0.5600	0.5693	0.5759	0.5828 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900			(26)				
TER Opening Type (Uw = 1.40)			10.4200	1.3258	13.8144			(27)				
External Wall	39.4300	10.4200	29.0100	0.1800	5.2218			(29a)				
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098			(29a)				
Total net area of external elements Aum(A, m2)			56.9300					(31)				
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	23.7360		(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								5.6018 (36)				
Total fabric heat loss								(33) + (36) = 29.3378 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 25.0373	Feb 24.8786	Mar 24.7230	Apr 23.9925	May 23.8558	Jun 23.2195	Jul 23.2195	Aug 23.1017	Sep 23.4646	Oct 23.8558	Nov 24.1323	Dec 24.4214 (38)
Heat transfer coeff	54.3751	54.2164	54.0608	53.3303	53.1936	52.5573	52.5573	52.4395	52.8024	53.1936	53.4701	53.7592 (39)
Average = Sum(39)m / 12 =												53.3296 (39)
HLP	Jan 1.0706	Feb 1.0675	Mar 1.0644	Apr 1.0500	May 1.0473	Jun 1.0348	Jul 1.0348	Aug 1.0325	Sep 1.0396	Oct 1.0473	Nov 1.0528	Dec 1.0585 (40)
HLP (average)												1.0500 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												
Average daily hot water use (litres/day)												1.7134 (42)
												74.8927 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.3700	11.8751	9.6575	7.3113	5.4653	4.6140	4.9856	6.4805	8.6981	11.0443	12.8903	13.7416	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.0571	317.3814	307.6675	292.1267	276.6192	261.4435	251.4333	256.2414	264.0903	279.8021	297.8468	311.1191	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W		
Southeast					6.2400	36.7938	0.6300	0.7000			0.7700			70.1668 (77)		
South					2.2100	46.7521	0.6300	0.7000			0.7700			31.5766 (78)		
Southwest					1.9700	36.7938	0.6300	0.7000			0.7700			22.1520 (79)		
Solar gains					123.8953	208.9673	281.0353	341.0471	376.1922	371.1129	358.7596	332.7706	301.7873	229.5768	148.0056	106.2907 (83)
Total gains					442.9525	526.3487	588.7027	633.1738	652.8114	632.5564	610.1929	589.0120	565.8776	509.3789	445.8524	417.4098 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	64.8658	65.0557	65.2428	66.1366	66.3065	67.1093	67.1093	67.2601	66.7978	66.3065	65.9636	65.6089	
alpha	5.3244	5.3370	5.3495	5.4091	5.4204	5.4740	5.4740	5.4840	5.4532	5.4204	5.3976	5.3739	
util living area	0.9887	0.9722	0.9357	0.8519	0.7087	0.5238	0.3778	0.4077	0.6218	0.8769	0.9736	0.9914	(86)
MIT	20.1179	20.3220	20.5623	20.8005	20.9396	20.9905	20.9987	20.9980	20.9764	20.7992	20.4181	20.0799	(87)
Th 2	20.0249	20.0275	20.0300	20.0419	20.0441	20.0544	20.0544	20.0564	20.0504	20.0441	20.0396	20.0349	(88)
util rest of house	0.9852	0.9643	0.9183	0.8160	0.6506	0.4499	0.2973	0.3251	0.5450	0.8383	0.9647	0.9888	(89)
MIT 2	18.8745	19.1679	19.5050	19.8279	19.9912	20.0487	20.0540	20.0556	20.0345	19.8362	19.3179	18.8271	(90)
Living area fraction	19.4993	19.7478	20.0363	20.3166	20.4677	20.5219	20.5286	20.5291	20.5078	20.3201	19.8707	19.4566	(91)
MIT	19.4993	19.7478	20.0363	20.3166	20.4677	20.5219	20.5286	20.5291	20.5078	20.3201	19.8707	19.4566	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4993	19.7478	20.0363	20.3166	20.4677	20.5219	20.5286	20.5291	20.5078	20.3201	19.8707	19.4566	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9829	0.9615	0.9185	0.8270	0.6772	0.4868	0.3378	0.3666	0.5828	0.8505	0.9628	0.9868	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	21.9611	32.9.8019	43.3.2182	42.9.2676	41.1.8993	(95)
Heat loss rate W	826.4619	804.9926	731.7828	608.8514	466.3876	311.2393	206.4788	216.5283	338.3458	517.0454	682.8493	820.1804	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	290.9645	200.8497	142.1671	61.3657	18.1010	0.0000	0.0000	0.0000	0.0000	62.3674	182.5788	303.7612	(98)
Space heating												1262.1553	(98)
Space heating per m2												24.8505	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1349.8987 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	290.9645	200.8497	142.1671	61.3657	18.1010	0.0000	0.0000	0.0000	0.0000	62.3674	182.5788	303.7612	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	311.1920	214.8125	152.0504	65.6317	19.3593	0.0000	0.0000	0.0000	0.0000	66.7031	195.2714	324.8782	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	86.2544	85.6122	84.5529	82.7641	80.9033	79.8000	79.8000	79.8000	79.8000	82.7217	85.2680	79.8000	(216)
Fuel for water heating, kWh/month	195.6597	173.9665	185.5115	170.6290	171.6021	156.2471	150.8144	164.4484	163.8315	176.9871	180.6589	190.8184	(219)
Water heating fuel used												2081.1746	(219)
Annual totals kWh/year													
Space heating fuel - main system												1349.8987	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												236.1179	(232)
Total delivered energy for all uses												3742.1912	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1349.8987	0.2160	291.5781 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2081.1746	0.2160	449.5337 (264)
Space and water heating			741.1118 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	236.1179	0.5190	122.5452 (268)
Total CO2, kg/m2/year			902.5820 (272)
Emissions per m2 for space and water heating			14.5917 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4128 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.5917 * 1.55) + 2.4128 + 0.7664, rounded to 2 d.p.			25.8000 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010537	Issued on Date	29/04/2022
Assessment Reference	103	Prop Type Ref	
Property			
SAP Rating	82 B	DER	16.66
Environmental	88 B	TER	28.08
CO ₂ Emissions (t/year)	0.96	% DER<TER	40.67
General Requirements Compliance	Pass	DFEE	47.31
		TFEE	55.18
		% DFEE<TFEE	14.26
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aecom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 28.08 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.66 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 55.2 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 47.3 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room stats OK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.61	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing North:	5.88 m ² , No overhang
Windows facing North West:	7.10 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	221.90 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												75.6500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			12.9800	1.1450	14.8626		(27)
External Wall	35.0800	12.9800	22.1000	0.1500	3.3150		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Core	18.2300		18.2300	0.2500	4.5575		(29a)
Main Roof	72.7700		72.7700	0.1000	7.2770		(30)
Total net area of external elements Aum(A, m2)			143.5800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	35.8046		(33)
Party Wall 1			18.3000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.2144 (36)
Total fabric heat loss							(33) + (36) = 46.0190 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	17.0688	16.8774	16.6860	15.7292	15.5379	14.5811	14.5811	14.3897	14.9638	15.5379	15.9206	16.3033 (38)
Heat transfer coeff	63.0878	62.8964	62.7050	61.7482	61.5569	60.6001	60.6001	60.4087	60.9828	61.5569	61.9396	62.3223 (39)
Average = Sum(39)m / 12 =												61.7004 (39)
HLP	0.8669	0.8643	0.8617	0.8485	0.8459	0.8328	0.8328	0.8301	0.8380	0.8459	0.8512	0.8564 (40)
HLP (average)												0.8479 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)												Total = Sum(45)m = 1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												

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	21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)
Water storage loss:												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h												
200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(64)
Heat gains from water heating, kWh/month												
92.5474	82.2081	87.8363	80.8195	80.7069	74.2791	73.3961	77.6998	76.6732	83.7032	85.8924	91.0225	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
18.2514	16.2107	13.1835	9.9807	7.4607	6.2986	6.8059	8.8466	11.8739	15.0766	17.5966	18.7587	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	(71)
Water heating gains (Table 5)												
124.3916	122.3335	118.0596	112.2492	108.4770	103.1654	98.6507	104.4353	106.4905	112.5044	119.2950	122.3421	(72)
Total internal gains												
403.9886	402.0033	389.3762	369.0248	348.4200	328.4945	315.5005	321.2122	331.6207	352.1755	375.7988	393.4597	(73)

6. Solar gains

[Jan]					Area	Solar flux	g	FF			Access	Gains
					m2	Table 6a	Specific data	Specific data			factor	W
						W/m2	or Table 6b	or Table 6c			Table 6d	
North					5.8800	10.6334	0.4000	0.8000			0.7700	13.8654
Northwest					7.1000	11.2829	0.4000	0.8000			0.7700	17.7649 (74)

Solar gains	31.6303	62.6585	110.1764	179.3190	241.2494	257.6284	240.8129	191.6050	133.5227	75.7335	39.4577	26.0666 (83)
Total gains	435.6190	464.6619	499.5526	548.3439	589.6693	586.1229	556.3134	512.8172	465.1433	427.9090	415.2565	419.5263 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1023	80.3460	80.5912	81.8400	82.0944	83.3906	83.3906	83.6547	82.8672	82.0944	81.5871	81.0861
alpha	6.3402	6.3564	6.3727	6.4560	6.4730	6.5594	6.5594	6.5770	6.5245	6.4730	6.4391	6.4057
util living area	0.9978	0.9962	0.9900	0.9599	0.8530	0.6461	0.4773	0.5374	0.8199	0.9743	0.9952	0.9983 (86)
MIT	20.1578	20.2515	20.4352	20.6985	20.9051	20.9875	20.9985	20.9969	20.9461	20.6949	20.3890	20.1434 (87)
Th 2	20.1957	20.1979	20.2002	20.2115	20.2137	20.2250	20.2250	20.2273	20.2205	20.2137	20.2092	20.2047 (88)
util rest of house	0.9971	0.9949	0.9865	0.9461	0.8101	0.5745	0.3943	0.4495	0.7558	0.9627	0.9934	0.9977 (89)
MIT 2	19.0628	19.2012	19.4695	19.8521	20.1209	20.2167	20.2244	20.2259	20.1771	19.8539	19.4107	19.0487 (90)
Living area fraction									fLA = Living area / (4) =			0.3848 (91)
MIT	19.4841	19.6053	19.8411	20.1777	20.4226	20.5133	20.5223	20.5226	20.4730	20.1775	19.7871	19.4699 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4841	19.6053	19.8411	20.1777	20.4226	20.5133	20.5223	20.5226	20.4730	20.1775	19.7871	19.4699 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9963	0.9937	0.9846	0.9454	0.8224	0.6017	0.4263	0.4835	0.7781	0.9621	0.9922	0.9970 (94)
Useful gains	434.0073	461.7346	491.8507	518.3851	484.9281	352.6851	237.1735	247.9270	361.9424	411.6894	412.0062	418.2885 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
957.9321	924.9119	836.5524	696.3803	536.9374	358.3453	237.6890	249.0393	388.6408	589.5607	785.8344	951.6560	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
389.8000	311.2551	256.4580	128.1565	38.6950	0.0000	0.0000	0.0000	0.0000	132.3363	269.1563	396.8254	(98)
Space heating												1922.6826 (98)
Space heating per m2												(98) / (4) =
												26.4214 (99)

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8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1922.6826 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	2155.3272 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	113.4383 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2052.6825 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2301.0570 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	121.1083 (310b)
Electricity used for heat distribution	46.9093 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	169.2357 (330a)
Total electricity for the above, kWh/year	169.2357 (331)
Electricity for lighting (calculated in Appendix L)	322.3254 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	5182.4919 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1782.5537	0.5190	925.1454 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	236.9157	0.5190	122.9592 (368)
Electrical energy for heat distribution	46.9093	0.5190	24.3459 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1072.4505 (373)
Space and water heating			1072.4505 (376)
Pumps and fans	169.2357	0.5190	87.8333 (378)
Energy for lighting	322.3254	0.5190	167.2869 (379)
Energy saving/generation technologies			
PV Unit	-221.9000	0.5190	-115.1661 (380)
Total CO2, kg/year			1212.4047 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			16.6600 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			16.6600 ZC1
Total Floor Area		TFA	72.7700
Assumed number of occupants		N	2.3115
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.5855 ZC2
CO2 emissions from cooking, equation (L16)			2.3976 ZC3
Total CO2 emissions			35.6431 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			35.6431 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1649 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4149 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3527 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4497	0.4408	0.4320	0.3879	0.3791	0.3350	0.3350	0.3262	0.3527	0.3791	0.3968	0.4144 (22b)
Effective ac	0.6011	0.5972	0.5933	0.5752	0.5719	0.5561	0.5561	0.5532	0.5622	0.5719	0.5787	0.5859 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			12.9800	1.3258	17.2083		(27)
External Wall	35.0800	12.9800	22.1000	0.1800	3.9780		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Core	18.2300		18.2300	0.1800	3.2814		(29a)
Main Roof	72.7700		72.7700	0.1300	9.4601		(30)
Total net area of external elements Aum(A, m ²)			143.5800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 38.6276		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.0934 (36)
Total fabric heat loss						(33) + (36) =	46.7210 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	36.0868	35.8511	35.6201	34.5351	34.3321	33.3870	33.3870	33.2120	33.7511	34.3321	34.7427	35.1721 (38)
Heat transfer coeff	82.8078	82.5721	82.3411	81.2561	81.0531	80.1081	80.1081	79.9331	80.4721	81.0531	81.4638	81.8931 (39)
Average = Sum(39)m / 12 =												81.2551 (39)
HLP	1.1379	1.1347	1.1315	1.1166	1.1138	1.1008	1.1008	1.0984	1.1058	1.1138	1.1195	1.1254 (40)
HLP (average)												1.1166 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)										Total = Sum(45)m =		1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												
21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133	(46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

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Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (64)
Heat gains from water heating, kWh/month	85.6018	75.9347	80.8908	74.0980	73.7613	67.5576	66.4506	70.7543	69.9517	76.7577	79.1709	84.0770 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5727	16.4961	13.4155	10.1564	7.5920	6.4095	6.9257	9.0023	12.0829	15.3420	17.9064	19.0889	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	(71)
Water heating gains (Table 5)	115.0562	112.9981	108.7242	102.9139	99.1416	93.8300	89.3153	95.0999	97.1551	103.1690	109.9597	113.0067	(72)
Total internal gains	397.9745	395.9533	383.2729	362.8651	342.2159	322.2700	309.2849	315.0325	325.4943	346.1056	369.7732	387.4546	(73)

6. Solar gains

[Jan]	Area m ²				Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North	5.8800				10.6334	0.6300	0.7000	0.7700	19.1083 (74)			
Northwest	7.1000				11.2829	0.6300	0.7000	0.7700	24.4823 (81)			
Solar gains	43.5906	86.3513	151.8369	247.1241	332.4718	355.0441	331.8703	264.0557	184.0109	104.3702	54.3776	35.9231 (83)
Total gains	441.5651	482.3046	535.1098	609.9892	674.6877	677.3141	641.1552	579.0882	509.5053	450.4758	424.1508	423.3777 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.0265	61.2007	61.3724	62.1919	62.3477	63.0832	63.0832	63.2213	62.7978	62.3477	62.0334	61.7081
alpha	5.0684	5.0800	5.0915	5.1461	5.1565	5.2055	5.2055	5.2148	5.1865	5.1565	5.1356	5.1139
util living area	0.9979	0.9963	0.9907	0.9656	0.8802	0.7044	0.5385	0.6119	0.8721	0.9812	0.9960	0.9983 (86)
MIT	19.7813	19.9014	20.1404	20.4882	20.7922	20.9537	20.9906	20.9826	20.8557	20.4791	20.0787	19.7644 (87)
Th 2	19.9700	19.9726	19.9752	19.9873	19.9896	20.0001	20.0001	20.0021	19.9961	19.9896	19.9850	19.9802 (88)
util rest of house	0.9972	0.9950	0.9872	0.9522	0.8358	0.6148	0.4220	0.4906	0.8071	0.9716	0.9943	0.9978 (89)
MIT 2	18.3459	18.5231	18.8727	19.3786	19.7841	19.9693	19.9967	19.9948	19.8755	19.3742	18.7914	18.3285 (90)
Living area fraction	18.8982	19.0534	19.3604	19.8055	20.1720	20.3481	20.3791	20.3749	20.2527	19.7994	19.2867	18.8810 (92)
Temperature adjustment	18.8982	19.0534	19.3604	19.8055	20.1720	20.3481	20.3791	20.3749	20.2527	19.7994	19.2867	18.8810 (93)
adjusted MIT	18.8982	19.0534	19.3604	19.8055	20.1720	20.3481	20.3791	20.3749	20.2527	19.7994	19.2867	18.8810 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9961	0.9934	0.9844	0.9493	0.8449	0.6477	0.4671	0.5376	0.8261	0.9692	0.9927	0.9969	(94)
Useful gains	439.8601	479.1310	526.7857	579.0521	570.0164	438.7070	299.4915	311.3024	420.9107	436.5878	421.0524	422.0565	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1208.8469	1168.6799	1058.9438	886.1419	686.6832	460.4690	302.7366	317.7238	495.1188	745.6361	992.7749	1202.2716	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	572.1262	463.3769	395.9256	221.1046	86.8001	0.0000	0.0000	0.0000	0.0000	229.9319	411.6402	580.4800	(98)
Space heating												2961.3856	(98)
Space heating per m ²												40.6951	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3167.2573 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	572.1262	463.3769	395.9256	221.1046	86.8001	0.0000	0.0000	0.0000	0.0000	229.9319	411.6402	580.4800	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	611.8996	495.5902	423.4499	236.4755	92.8343	0.0000	0.0000	0.0000	0.0000	245.9165	440.2569	620.8343	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500	(64)
Efficiency of water heater (217)m	87.5510	87.3666	86.8899	85.6861	83.3169	79.8000	79.8000	79.8000	79.8000	85.6937	87.0232	87.6329	(216)
Fuel for water heating, kWh/month	219.2276	193.6690	204.5894	186.0878	187.6277	175.1642	168.3438	184.5636	184.1870	192.9396	200.7605	213.7895	(219)
Water heating fuel used												2310.9496	(219)
Annual totals kWh/year													
Space heating fuel - main system												3167.2573	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												327.9999	(232)
Total delivered energy for all uses												5881.2067	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3167.2573	0.2160	684.1276 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2310.9496	0.2160	499.1651 (264)
Space and water heating			1183.2927 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	327.9999	0.5190	170.2319 (268)
Total CO2, kg/m2/year			1392.4496 (272)
Emissions per m2 for space and water heating			16.2607 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3393 (272b)
Emissions per m2 for pumps and fans			0.5349 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.2607 * 1.55) + 2.3393 + 0.5349, rounded to 2 d.p.			28.0800 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010538			Issued on Date	29/04/2022
Assessment Reference	104	Prop Type Ref			
Property					
SAP Rating	83 B	DER	15.78	TER	26.42
Environmental	89 B	% DER<TER	40.26		
CO ₂ Emissions (t/year)	0.94	DFEE	44.00	TFEE	50.74
General Requirements Compliance	Fail	% DFEE<TFEE	13.28		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 74 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 26.42 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.78 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)50.7 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)44.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.61	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing North:	1.97 m ² , No overhang
Windows facing North East:	9.35 m ² , No overhang
Windows facing East:	2.21 m ² , No overhang
Windows facing South East:	6.24 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	221.90 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												75.6500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			19.7700	1.1450	22.6374		(27)
External Wall	49.6500	19.7700	29.8800	0.1500	4.4820		(29a)
Corridor	5.4000	1.8900	3.5100	0.2500	0.8775		(29a)
Main Roof	73.5200		73.5200	0.1000	7.3520		(30)
Total net area of external elements Aum(A, m ²)				128.5700			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	37.2389		(33)
Party Wall 1			38.0500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.0914 (36)
Total fabric heat loss							(33) + (36) = 49.3303 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	17.2447	17.0514	16.8580	15.8913	15.6980	14.7313	14.7313	14.5380	15.1180	15.6980	16.0847	16.4714 (38)
Average = Sum(39)m / 12 =	66.5750	66.3817	66.1883	65.2217	65.0283	64.0616	64.0616	63.8683	64.4483	65.0283	65.4150	65.8017 (39)
												65.1733 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9055	0.9029	0.9003	0.8871	0.8845	0.8713	0.8713	0.8687	0.8766	0.8845	0.8898	0.8950 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												
Average daily hot water use (litres/day)												2.3285 (42)
												89.5010 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy content (annual)	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1408.1991 (45)
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	201.2769	177.6201	187.0442	168.3717	165.5050	148.6122	143.4181	156.4202	155.8451	174.5575	183.6979	196.6701	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
	Solar input (sum of months) = Sum (63)m =											0.0000 (63)	
Output from w/h													
	201.2769	177.6201	187.0442	168.3717	165.5050	148.6122	143.4181	156.4202	155.8451	174.5575	183.6979	196.6701	(64)
	Total per year (kWh/year) = Sum (64)m =											2059.0388 (64)	
Heat gains from water heating, kWh/month													
	92.7665	82.3997	88.0341	80.9919	80.8723	74.4219	73.5284	77.8516	76.8268	83.8823	86.0878	91.2347	(65)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1717.6202 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1925.4522 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	101.3396 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2059.0388 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2308.1825 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	121.4833 (310b)
Electricity used for heat distribution	44.5646 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	170.9800 (330a)
Total electricity for the above, kWh/year	170.9800 (331)
Electricity for lighting (calculated in Appendix L)	323.3395 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	4950.7771 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1693.4539	0.5190	878.9026 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	225.0736	0.5190	116.8132 (368)
Electrical energy for heat distribution	44.5646	0.5190	23.1290 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1018.8448 (373)
Space and water heating			1018.8448 (376)
Pumps and fans	170.9800	0.5190	88.7386 (378)
Energy for lighting	323.3395	0.5190	167.8132 (379)
Energy saving/generation technologies			
PV Unit	-221.9000	0.5190	-115.1661 (380)
Total CO2, kg/year			1160.2305 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.7800 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		15.7800 ZC1
Total Floor Area	TFA	73.5200
Assumed number of occupants	N	2.3285
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.5530 ZC2
CO2 emissions from cooking, equation (L16)		2.3787 ZC3
Total CO2 emissions		34.7117 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		34.7117 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1632 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4132 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3512 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4478	0.4390	0.4303	0.3864	0.3776	0.3337	0.3337	0.3249	0.3512	0.3776	0.3951	0.4127 (22b)
	0.6003	0.5964	0.5926	0.5746	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			16.4900	1.3258	21.8617		(27)
External Wall	49.6500	16.4900	33.1600	0.1800	5.9688		(29a)
Corridor	5.4000	1.8900	3.5100	0.1800	0.6318		(29a)
Main Roof	73.5200		73.5200	0.1300	9.5576		(30)
Total net area of external elements Aum(A, m ²)			128.5700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.9099		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.8504 (36)
Total fabric heat loss						(33) + (36) =	48.7603 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.4091	36.1729	35.9414	34.8541	34.6506	33.7036	33.7036	33.5282	34.0684	34.6506	35.0622	35.4924 (38)
Heat transfer coeff	85.1694	84.9332	84.7018	83.6144	83.4110	82.4639	82.4639	82.2886	82.8287	83.4110	83.8225	84.2528 (39)
Average = Sum(39)m / 12 =												83.6134 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1585	1.1552	1.1521	1.1373	1.1345	1.1217	1.1217	1.1193	1.1266	1.1345	1.1401	1.1460 (40)
HLP (average)												1.1373 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy content (annual)	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1408.1991 (45)
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
Heat gains from water heating, kWh/month	85.8210	76.1264	81.0886	74.2704	73.9268	67.7004	66.5829	70.9061	70.1053	76.9367	79.3664	84.2892 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3070	16.2601	13.2236	10.0111	7.4834	6.3178	6.8266	8.8735	11.9100	15.1225	17.6502	18.8158 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385 (71)
Water heating gains (Table 5)	115.3508	113.2833	108.9900	103.1533	99.3640	94.0283	89.4931	95.3039	97.3685	103.4096	110.2311	113.2919 (72)
Total internal gains	399.9539	397.9707	385.2706	364.7888	344.0400	323.9750	310.8872	316.6137	327.0851	347.7714	371.5522	389.3425 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W			
North				1.6400	10.6334	0.6300	0.7000	0.7700	5.3295 (74)			
Northeast				7.8000	11.2829	0.6300	0.7000	0.7700	26.8961 (75)			
East				1.8400	19.6403	0.6300	0.7000	0.7700	11.0443 (76)			
Southeast				5.2100	36.7938	0.6300	0.7000	0.7700	58.5847 (77)			
Solar gains	101.8546	186.3291	288.0641	410.8612	508.2861	525.4572	497.9438	422.2753	330.2245	214.9569	124.3588	85.6262 (83)
Total gains	501.8085	584.2998	673.3347	775.6500	852.3261	849.4322	808.8310	738.8890	657.3096	562.7283	495.9110	474.9687 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.9459	60.1126	60.2769	61.0607	61.2096	61.9126	61.9126	62.0445	61.6399	61.2096	60.9091	60.5981	
alpha	4.9964	5.0075	5.0185	5.0707	5.0806	5.1275	5.1275	5.1363	5.1093	5.0806	5.0606	5.0399	
util living area	0.9964	0.9918	0.9773	0.9243	0.7938	0.5996	0.4445	0.5041	0.7728	0.9580	0.9923	0.9973 (86)	
MIT	19.8236	19.9945	20.2720	20.6225	20.8730	20.9764	20.9958	20.9922	20.9185	20.5793	20.1387	19.7961 (87)	
Th 2	19.9534	19.9560	19.9585	19.9705	19.9727	19.9832	19.9832	19.9851	19.9792	19.9727	19.9682	19.9635 (88)	
util rest of house	0.9953	0.9891	0.9696	0.8995	0.7367	0.5135	0.3440	0.3971	0.6915	0.9390	0.9893	0.9964 (89)	
MIT 2	18.3958	18.6461	19.0475	19.5431	19.8562	19.9686	19.9817	19.9821	19.9182	19.4973	18.8660	18.3629 (90)	
Living area fraction									fLA = Living area / (4) =			0.3678 (91)	
MIT	18.9210	19.1420	19.4978	19.9401	20.2302	20.3393	20.3547	20.3536	20.2861	19.8953	19.3341	18.8900 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.9210	19.1420	19.4978	19.9401	20.2302	20.3393	20.3547	20.3536	20.2861	19.8953	19.3341	18.8900 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9936	0.9863	0.9653	0.8987	0.7521	0.5445	0.3811	0.4366	0.7179	0.9372	0.9868	0.9950 (94)
Useful gains	498.6007	576.2983	649.9444	697.0690	641.0413	462.5377	308.2314	322.6268	471.9040	527.4135	489.3498	472.6166 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1245.2596	1209.6195	1100.9398	923.1084	711.5096	473.2813	309.6252	325.3392	512.3857	775.3286	1025.4940	1237.6725 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	555.5143	425.5918	335.5405	162.7484	52.4284	0.0000	0.0000	0.0000	0.0000	184.4488	386.0238	569.2016 (98)
Space heating												2671.4977 (98)
Space heating per m2										(98) / (4) =		36.3370 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2857.2168 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	555.5143	425.5918	335.5405	162.7484	52.4284	0.0000	0.0000	0.0000	0.0000	184.4488	386.0238	569.2016	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	594.1329	455.1784	358.8669	174.0625	56.0732	0.0000	0.0000	0.0000	0.0000	197.2715	412.8596	608.7718	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882	(64)
Efficiency of water heater (217)m	87.4803	87.1671	86.4756	84.8598	82.2361	79.8000	79.8000	79.8000	79.8000	85.0973	86.8627	79.8000	(216)
Fuel for water heating, kWh/month	220.1583	194.7735	206.2572	188.5108	190.6986	175.7022	168.8423	185.1357	184.7660	194.9246	201.8081	214.6367	(219)
Water heating fuel used												2326.2141	(219)
Annual totals kWh/year													
Space heating fuel - main system												2857.2168	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												323.3067	(232)
Total delivered energy for all uses												5581.7376	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2857.2168	0.2160	617.1588 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2326.2141	0.2160	502.4622 (264)
Space and water heating			1119.6211 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	323.3067	0.5190	167.7962 (268)
Total CO2, kg/m2/year			1326.3423 (272)
Emissions per m2 for space and water heating			15.2288 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.2823 (272b)
Emissions per m2 for pumps and fans			0.5294 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.2288 * 1.55) + 2.2823 + 0.5294, rounded to 2 d.p.			26.4200 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010539	Issued on Date	29/04/2022
Assessment Reference	105	Prop Type Ref	
Property			
SAP Rating	83 B	DER	15.51
Environmental	90 B	TER	26.89
CO ₂ Emissions (t/year)	0.66	% DER<TER	42.31
General Requirements Compliance	Pass	DFEE	38.30
		TFEE	41.63
		% DFEE<TFEE	8.00
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 26.89 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.51 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)41.6 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)38.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing South East:	6.24 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	221.90 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)
External Wall	19.8500	8.4500	11.4000	0.1500	1.7100		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Main Roof	50.7900		50.7900	0.1000	5.0790		(30)
Total net area of external elements Aum(A, m ²)			88.1400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.2571		(33)
Party Wall 1			37.0000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.5542 (36)
Total fabric heat loss							(33) + (36) = 30.8113 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	11.1341	11.0123	10.8905	10.2816	10.1599	9.5510	9.5510	9.4292	9.7945	10.1599	10.4034	10.6470 (38)
Average = Sum(39)m / 12 =	41.9454	41.8236	41.7018	41.0929	40.9711	40.3623	40.3623	40.2405	40.6058	40.9711	41.2147	41.4582 (39)
												41.0625 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8259	0.8235	0.8211	0.8091	0.8067	0.7947	0.7947	0.7923	0.7995	0.8067	0.8115	0.8163 (40)
Days in month												0.8085 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy content (annual)	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1178.3544 (45)
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)

Water storage loss:												
Store volume												
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												
Volume factor from Table 2a												
Temperature factor from Table 2b												
Enter (49) or (54) in (55)												
Total storage loss												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144 (56)
If cylinder contains dedicated solar storage												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
Solar input	177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921 (62)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
	Solar input (sum of months) = Sum(63)m =											0.0000 (63)
Output from w/h	177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921 (64)
	Total per year (kWh/year) = Sum(64)m =											1829.1942 (64)
Heat gains from water heating, kWh/month												
	84.8430	75.4698	80.8830	74.7574	74.8902	69.2597	68.7450	72.3625	71.2721	77.4089	79.0216	83.5613 (65)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9848	0.9686	0.9332	0.8489	0.6986	0.4989	0.3472	0.3711	0.5830	0.8528	0.9648	0.9881 (94)
Useful gains	393.2768	434.0044	448.4366	424.1129	352.1053	242.2178	162.6060	170.1565	261.7406	360.3713	378.6361	376.4273 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	655.3093	635.2724	575.1552	476.4252	364.4698	243.3097	162.6839	170.2784	264.8045	406.0864	539.9450	650.6056 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	194.9522	135.2521	94.2787	37.6648	9.1992	0.0000	0.0000	0.0000	0.0000	34.0121	116.1424	203.9887 (98)
Space heating												825.4902 (98)
Space heating per m2												16.2530 (99)
										(98) / (4) =		

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	825.4902 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	925.3745 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	48.7039 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2050.5266 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	107.9225 (310b)
Electricity used for heat distribution	31.3253 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	238.1302 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	3492.6490 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1190.3605	0.5190	617.7971 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	158.2085	0.5190	82.1102 (368)
Electrical energy for heat distribution	31.3253	0.5190	16.2578 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			716.1651 (373)
Space and water heating			716.1651 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	238.1302	0.5190	123.5896 (379)
Energy saving/generation technologies			
PV Unit	-221.9000	0.5190	-115.1661 (380)
Total CO2, kg/year			787.9020 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.5100 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		15.5100 ZC1
Total Floor Area	TFA	50.7900
Assumed number of occupants	N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.4175 ZC2
CO2 emissions from cooking, equation (L16)		3.1526 ZC3
Total CO2 emissions		36.0801 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		36.0801 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	+	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) = 0.1575 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4075 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
Effective ac	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)
External Wall	19.8500	8.4500	11.4000	0.1800	2.0520		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Main Roof	50.7900		50.7900	0.1300	6.6027		(30)
Total net area of external elements Aum(A, m ²)			88.1400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	24.5572	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.8980 (36)
Total fabric heat loss						(33) + (36) =	30.4552 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	24.3480	24.2160	24.0867	23.4794	23.3658	22.8368	22.8368	22.7389	23.0406	23.3658	23.5957	23.8360 (38)
Heat transfer coeff	54.8031	54.6712	54.5419	53.9346	53.8209	53.2920	53.2920	53.1940	53.4957	53.8209	54.0508	54.2911 (39)
Average = Sum(39)m / 12 =												53.9340 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0790	1.0764	1.0739	1.0619	1.0597	1.0493	1.0493	1.0473	1.0533	1.0597	1.0642	1.0689 (40)
HLP (average)												1.0619 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												

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Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
Heat gains from water heating, kWh/month	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782 (72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Southeast				6.2400	36.7938	0.6300	0.7000	0.7700	70.1668 (77)			
South				2.2100	46.7521	0.6300	0.7000	0.7700	31.5766 (78)			

Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains	421.2115	488.9806	537.3716	569.4289	581.3281	561.5651	541.7662	526.3621	510.2428	468.0154	419.7157	398.8747 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	64.3592	64.5145	64.6674	65.3956	65.5337	66.1841	66.1841	66.3060	65.9321	65.5337	65.2550	64.9661
alpha	5.2906	5.3010	5.3112	5.3597	5.3689	5.4123	5.4123	5.4204	5.3955	5.3689	5.3503	5.3311
util living area	0.9910	0.9798	0.9549	0.8941	0.7738	0.5906	0.4302	0.4609	0.6835	0.9078	0.9799	0.9931 (86)
MIT	20.0675	20.2482	20.4792	20.7304	20.9047	20.9823	20.9973	20.9961	20.9617	20.7465	20.3613	20.0316 (87)
Th 2	20.0180	20.0201	20.0222	20.0321	20.0339	20.0425	20.0425	20.0441	20.0392	20.0339	20.0302	20.0263 (88)
util rest of house	0.9883	0.9738	0.9416	0.8642	0.7174	0.5094	0.3380	0.3672	0.6035	0.8752	0.9728	0.9910 (89)
MIT 2	18.7967	19.0581	19.3863	19.7340	19.9472	20.0315	20.0415	20.0426	20.0122	19.7637	19.2307	18.7509 (90)
Living area fraction												
MIT	19.4352	19.6561	19.9355	20.2346	20.4283	20.5092	20.5218	20.5217	20.4893	20.2575	19.7988	19.3944 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4352	19.6561	19.9355	20.2346	20.4283	20.5092	20.5218	20.5217	20.4893	20.2575	19.7988	19.3944 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	415.3798	474.8243	505.2408	496.0153	431.0934	308.7200	208.2563	218.1346	327.7239	413.5580	407.4408	394.5505 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	829.4572	806.7324	732.7957	611.3287	469.7640	314.9151	208.9986	219.2486	341.7992	519.7751	686.3799	824.9231 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	308.0736	223.0422	169.3008	83.0256	28.7710	0.0000	0.0000	0.0000	0.0000	79.0255	200.8362	320.1972 (98)
Space heating												1412.2721 (98)
Space heating per m2										(98) / (4) =		27.8061 (99)

8c. Space cooling requirement

Not applicable

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9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1510.4515 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	308.0736	223.0422	169.3008	83.0256	28.7710	0.0000	0.0000	0.0000	0.0000	79.0255	200.8362	320.1972	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	329.4905	238.5478	181.0704	88.7974	30.7711	0.0000	0.0000	0.0000	0.0000	84.5192	214.7981	342.4569	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	86.3998	85.8889	85.0177	83.4531	81.4532	79.8000	79.8000	79.8000	79.8000	83.2504	85.5224	79.8000	(216)
Fuel for water heating, kWh/month	195.3304	173.4059	184.4973	169.2202	170.4436	156.2471	150.8144	164.4484	163.8315	175.8630	180.1216	190.5271	(219)
Water heating fuel used												2074.7506	(219)
Annual totals kWh/year													
Space heating fuel - main system												1510.4515	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												3903.5784	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1510.4515	0.2160	326.2575 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2074.7506	0.2160	448.1461 (264)
Space and water heating			774.4036 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			939.6410 (272)
Emissions per m2 for space and water heating			15.2472 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.2472 * 1.55) + 2.4870 + 0.7664, rounded to 2 d.p.			26.8900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010540			Issued on Date	29/04/2022
Assessment Reference	106	Prop Type Ref			
Property					
SAP Rating	82 B	DER	16.60	TER	28.65
Environmental	90 B	% DER<TER	42.07		
CO ₂ Emissions (t/year)	0.70	DFEE	42.30	TFEE	48.19
General Requirements Compliance	Fail	% DFEE<TFEE	12.22		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 28.65 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.60 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)48.2 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)42.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing South East:	6.24 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Windows facing South West:	1.97 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	221.90 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			10.4200	1.1450	11.9313		(27)
External Wall	39.4300	10.4200	29.0100	0.1500	4.3515		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Main Roof	50.7900		50.7900	0.1000	5.0790		(30)
Total net area of external elements Aum(A, m ²)			107.7200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	27.1543			(33)
Party Wall 1			17.0500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.4474 (36)
Total fabric heat loss							(33) + (36) = 35.6017 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	11.7351	11.6015	11.4680	10.8002	10.6666	9.9988	9.9988	9.8652	10.2659	10.6666	10.9337	11.2009 (38)
Average = Sum(39)m / 12 =	47.3368	47.2032	47.0697	46.4019	46.2683	45.6005	45.6005	45.4669	45.8676	46.2683	46.5354	46.8026 (39)
	47.3368	47.2032	47.0697	46.4019	46.2683	45.6005	45.6005	45.4669	45.8676	46.2683	46.5354	46.3685 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9320	0.9294	0.9268	0.9136	0.9110	0.8978	0.8978	0.8952	0.9031	0.9110	0.9162	0.9215 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy content (annual)	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum (63)m =													0.0000 (63)
Output from w/h	177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(64)
Total per year (kWh/year) = Sum (64)m =													1829.1942 (64)
Heat gains from water heating, kWh/month													
	84.8430	75.4698	80.8830	74.7574	74.8902	69.2597	68.7450	72.3625	71.2721	77.4089	79.0216	83.5613	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.3089	11.8209	9.6134	7.2779	5.4403	4.5930	4.9629	6.4509	8.6584	10.9938	12.8314	13.6788 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	114.0363	112.3063	108.7138	103.8297	100.6589	96.1941	92.3992	97.2615	98.9891	104.0442	109.7522	112.3135 (72)
Total internal gains	325.3314	323.6625	313.9587	298.4287	282.9297	267.7578	257.7459	262.5472	270.3860	286.0871	304.1233	317.3917 (73)

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	

Southeast					6.2400	36.7938	0.4000	0.8000	0.7700		50.9147 (77)	
South					2.2100	46.7521	0.4000	0.8000	0.7700		22.9127 (78)	
Southwest					1.9700	36.7938	0.4000	0.8000	0.7700		16.0740 (79)	

Solar gains	89.9014	151.6316	203.9258	247.4718	272.9739	269.2882	260.3244	241.4662	218.9840	166.5863	107.3964	77.1270 (83)
Total gains	415.2328	475.2941	517.8846	545.9005	555.9036	537.0461	518.0703	504.0134	489.3700	452.6734	411.5197	394.5187 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil/m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	74.5104	74.7212	74.9332	76.0117	76.2311	77.3475	77.3475	77.5747	76.8970	76.2311	75.7935	75.3609
alpha	5.9674	5.9814	5.9955	6.0674	6.0821	6.1565	6.1565	6.1716	6.1265	6.0821	6.0529	6.0241
util living area	0.9897	0.9765	0.9461	0.8703	0.7300	0.5375	0.3866	0.4139	0.6302	0.8836	0.9754	0.9921 (86)
MIT	20.2691	20.4300	20.6289	20.8331	20.9527	20.9939	20.9993	20.9990	20.9843	20.8430	20.5260	20.2381 (87)
Th 2	20.1404	20.1426	20.1448	20.1560	20.1582	20.1693	20.1693	20.1716	20.1649	20.1582	20.1537	20.1493 (88)
util rest of house	0.9867	0.9699	0.9315	0.8388	0.6771	0.4704	0.3140	0.3399	0.5606	0.8486	0.9674	0.9898 (89)
MIT 2	19.1811	19.4132	19.6936	19.9738	20.1159	20.1656	20.1691	20.1712	20.1540	19.9937	19.5615	19.1433 (90)
Living area fraction	19.1811	19.4132	19.6936	19.9738	20.1159	20.1656	20.1691	20.1712	20.1540	19.9937	19.5615	19.1433 (90)
MIT	19.7278	19.9241	20.1635	20.4055	20.5363	20.5818	20.5862	20.5871	20.5712	20.4204	20.0461	19.6934 (91)
Temperature adjustment	19.7278	19.9241	20.1635	20.4055	20.5363	20.5818	20.5862	20.5871	20.5712	20.4204	20.0461	19.6934 (93)
adjusted MIT	19.7278	19.9241	20.1635	20.4055	20.5363	20.5818	20.5862	20.5871	20.5712	20.4204	20.0461	19.6934 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9849	0.9679	0.9319	0.8488	0.7016	0.5040	0.3505	0.3771	0.5951	0.8604	0.9661	0.9882 (94)
Useful gains	408.9448	460.0508	482.6091	463.3442	390.0167	270.6819	181.5878	190.0833	291.2007	389.4821	397.5887	389.8564 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	730.3022	709.1870	643.1383	533.8790	408.8427	272.7709	181.7747	190.3747	296.8182	454.3748	602.4526	725.1309 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	239.0899	167.4195	119.4337	50.7851	14.0065	0.0000	0.0000	0.0000	0.0000	48.2802	147.5020	249.4442 (98)
Space heating												1035.9611 (99)
Space heating per m2										(98) / (4) =		20.3970 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump	0.9500	(303a)
Fraction of heat from community Boilers	0.0500	(303b)
Fraction of total space heat from community Heat pump	0.9500	(304a)
Fraction of total space heat from community Boilers	0.0500	(304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.1800	(306)
Space heating:		
Annual space heating requirement	1035.9611	(98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1161.3124	(307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	61.1217	(307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1829.1942	(64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2050.5266	(310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	107.9225	(310b)
Electricity used for heat distribution	33.8088	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	121.9912	(330a)
Total electricity for the above, kWh/year	121.9912	(331)
Electricity for lighting (calculated in Appendix L)	235.0396	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
Total delivered energy for all uses	3737.9141	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			250.0000	(367a)
Space heating from Heat pump	1284.7356	0.5190	666.7778	(367)
Efficiency of heat source Boilers			99.0000	(367b)
Space heating from Boilers	170.7517	0.5190	88.6201	(368)
Electrical energy for heat distribution	33.8088	0.5190	17.5468	(372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			772.9447	(373)
Space and water heating			772.9447	(376)
Pumps and fans	121.9912	0.5190	63.3134	(378)
Energy for lighting	235.0396	0.5190	121.9856	(379)
Energy saving/generation technologies				
PV Unit	-221.9000	0.5190	-115.1661	(380)
Total CO2, kg/year			843.0776	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			16.6000	(384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			16.6000	ZC1
Total Floor Area		TFA	50.7900	
Assumed number of occupants		N	1.7134	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			17.4175	ZC2
CO2 emissions from cooking, equation (L16)			3.1526	ZC3
Total CO2 emissions			37.1701	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			37.1701	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.1575 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4075 (18)
Number of sides sheltered					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3464 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4416	0.4330	0.4243	0.3810	0.3724	0.3291	0.3291	0.3204	0.3464	0.3724	0.3897	0.4070 (22b)
	0.5975	0.5937	0.5900	0.5726	0.5693	0.5541	0.5541	0.5513	0.5600	0.5693	0.5759	0.5828 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			10.4200	1.3258	13.8144		(27)
External Wall	39.4300	10.4200	29.0100	0.1800	5.2218		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Main Roof	50.7900		50.7900	0.1300	6.6027		(30)
Total net area of external elements Aum(A, m ²)			107.7200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 30.3387		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.6479 (36)
Total fabric heat loss							(33) + (36) = 36.9866 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	25.0373	24.8786	24.7230	23.9925	23.8558	23.2195	23.2195	23.1017	23.4646	23.8558	24.1323	24.4214 (38)
Heat transfer coeff	62.0239	61.8652	61.7096	60.9791	60.8424	60.2061	60.2061	60.0883	60.4512	60.8424	61.1189	61.4080 (39)
Average = Sum(39)m / 12 =												60.9784 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2212	1.2181	1.2150	1.2006	1.1979	1.1854	1.1854	1.1831	1.1902	1.1979	1.2034	1.2091 (40)
HLP (average)												1.2006 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
Heat gains from water heating, kWh/month	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.3700	11.8751	9.6575	7.3113	5.4653	4.6140	4.9856	6.4805	8.6981	11.0443	12.8903	13.7416 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782 (72)
Total internal gains	319.0571	317.3814	307.6675	292.1267	276.6192	261.4435	251.4333	256.2414	264.0903	279.8021	297.8468	311.1191 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Southeast				6.2400	36.7938	0.6300	0.7000	0.7700	70.1668 (77)			
South				2.2100	46.7521	0.6300	0.7000	0.7700	31.5766 (78)			
Southwest				1.9700	36.7938	0.6300	0.7000	0.7700	22.1520 (79)			
Solar gains	123.8953	208.9673	281.0353	341.0471	376.1922	371.1129	358.7596	332.7706	301.7873	229.5768	148.0056	106.2907 (83)
Total gains	442.9525	526.3487	588.7027	633.1738	652.8114	632.5564	610.1929	589.0120	565.8776	509.3789	445.8524	417.4098 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)	21.0000 (85)											
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	56.8666	57.0124	57.1561	57.8409	57.9708	58.5835	58.5835	58.6984	58.3460	57.9708	57.7085	57.4369
alpha	4.7911	4.8008	4.8104	4.8561	4.8647	4.9056	4.9056	4.9132	4.8897	4.8647	4.8472	4.8291
util living area	0.9902	0.9774	0.9500	0.8860	0.7653	0.5870	0.4300	0.4631	0.6848	0.9057	0.9786	0.9924 (86)
MIT	19.9098	20.1204	20.3868	20.6759	20.8786	20.9743	20.9954	20.9934	20.9457	20.6858	20.2433	19.8705 (87)
Th 2	19.9031	19.9056	19.9080	19.9195	19.9217	19.9317	19.9317	19.9336	19.9278	19.9217	19.9173	19.9128 (88)
util rest of house	0.9870	0.9705	0.9349	0.8529	0.7042	0.4983	0.3278	0.3589	0.5979	0.8708	0.9709	0.9900 (89)
MIT 2	18.4846	18.7887	19.1665	19.5655	19.8129	19.9162	19.9302	19.9311	19.8903	19.5898	18.9772	18.4346 (90)
Living area fraction	19.2007	19.4578	19.7796	20.1234	20.3483	20.4478	20.4654	20.4649	20.4206	20.1405	19.6133	19.1561 (92)
Temperature adjustment	19.2007	19.4578	19.7796	20.1234	20.3483	20.4478	20.4654	20.4649	20.4206	20.1405	19.6133	19.1561 (93)
adjusted MIT	19.2007	19.4578	19.7796	20.1234	20.3483	20.4478	20.4654	20.4649	20.4206	20.1405	19.6133	19.1561 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9844	0.9670	0.9328	0.8598	0.7297	0.5422	0.3793	0.4114	0.6395	0.8788	0.9682	0.9878 (94)
Ext temp.	436.0529	508.9813	549.1400	544.4072	476.3684	342.9759	231.4431	242.3481	361.9026	447.6444	431.6522	412.3060 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Month fracti	924.2001	900.6226	819.4823	684.3953	526.1859	352.0754	232.7198	244.2507	382.0875	580.4667	764.8008	918.4241 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating per m ²	363.1815	263.1829	201.1347	100.7914	37.0642	0.0000	0.0000	0.0000	0.0000	98.8198	239.8670	376.5519 (98)
Space heating	1680.5935 (98)											
Space heating per m ²	(98) / (4) = 33.0891 (99)											

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1797.4262 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	363.1815	263.1829	201.1347	100.7914	37.0642	0.0000	0.0000	0.0000	0.0000	98.8198	239.8670	376.5519	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	388.4294	281.4791	215.1173	107.7983	39.6409	0.0000	0.0000	0.0000	0.0000	105.6896	256.5422	402.7293	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	86.8072	86.3173	85.4781	83.9329	81.8389	79.8000	79.8000	79.8000	79.8000	83.7922	85.9910	86.9492	(216)
Fuel for water heating, kWh/month	194.4136	172.5454	183.5035	168.2529	169.6403	156.2471	150.8144	164.4484	163.8315	174.7259	179.1400	189.6626	(219)
Water heating fuel used												2067.2255	(219)
Annual totals kWh/year													
Space heating fuel - main system												1797.4262	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												236.1179	(232)
Total delivered energy for all uses												4175.7696	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1797.4262	0.2160	388.2440 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2067.2255	0.2160	446.5207 (264)
Space and water heating			834.7648 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	236.1179	0.5190	122.5452 (268)
Total CO2, kg/m2/year			996.2349 (272)
Emissions per m2 for space and water heating			16.4356 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4128 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.4356 * 1.55) + 2.4128 + 0.7664, rounded to 2 d.p.			28.6500 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010541	Issued on Date	29/04/2022
Assessment Reference	107	Prop Type Ref	
Property			
SAP Rating	82 B	DER	15.04
Environmental	89 B	TER	28.69
CO ₂ Emissions (t/year)	0.82	% DER<TER	47.59
General Requirements Compliance	Pass	DFEE	48.02
		TFEE	56.74
		% DFEE<TFEE	15.36
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com		Assessor ID
Client	E682-0001		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Ground-floor flat, total floor area 70 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 28.69 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.04 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)56.7 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)48.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing North East:	5.10 m ² , No overhang
Windows facing East:	2.21 m ² , No overhang
Windows facing South East:	6.24 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	454.01 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	70.0600 (1b)	x 2.8000 (2b)	= 196.1680 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 196.1680 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			13.5500	1.1450	15.5153		(27)					
Ground Floor			70.0600	0.1000	7.0060		(28a)					
External Wall	48.1900	13.5500	34.6400	0.1500	5.1960		(29a)					
Corridor	7.5900	1.8900	5.7000	0.2500	1.4250		(29a)					
Unheated	19.4900		19.4900	0.2000	3.8980		(29a)					
Total net area of external elements Aum(A, m2)			145.3300				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		34.9303		(33)					
Party Wall 1			24.1400	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.5810 (36)					
Total fabric heat loss							(33) + (36) = 46.5113 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	18.1300	17.9236	17.7173	16.6856	16.4792	15.4475	15.4475	15.2412	15.8602	16.4792	16.8919	17.3046 (38)
Average = Sum(39)m / 12 =	64.6412	64.4349	64.2285	63.1968	62.9905	61.9588	61.9588	61.7524	62.3714	62.9905	63.4032	63.8159 (39)
												63.1452 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9227	0.9197	0.9168	0.9020	0.8991	0.8844	0.8844	0.8814	0.8903	0.8991	0.9050	0.9109 (40)
Days in month												0.9013 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2476 (42)
Average daily hot water use (litres/day)												87.5800 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.3380	92.8348	89.3316	85.8284	82.3252	78.8220	78.8220	82.3252	85.8284	89.3316	92.8348	96.3380 (44)
Energy conte	142.8665	124.9520	128.9393	112.4124	107.8623	93.0770	86.2495	98.9726	100.1546	116.7206	127.4096	138.3586 (45)
Energy content (annual)												Total = Sum(45)m = 1377.9751 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	21.4300	18.7428	19.3409	16.8619	16.1794	13.9616	12.9374	14.8459	15.0232	17.5081	19.1114	20.7538 (46)
Water storage loss:												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
198.1433	174.8794	184.2161	165.9060	163.1391	146.5707	141.5263	154.2494	153.6483	171.9974	180.9033	193.6354	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
198.1433	174.8794	184.2161	165.9060	163.1391	146.5707	141.5263	154.2494	153.6483	171.9974	180.9033	193.6354	(64)
Heat gains from water heating, kWh/month												
91.7246	81.4885	87.0937	80.1721	80.0857	73.7430	72.8994	77.1298	76.0964	83.0310	85.1586	90.2257	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
17.6053	15.6368	12.7167	9.6274	7.1966	6.0757	6.5650	8.5334	11.4535	14.5428	16.9736	18.0946	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
197.4371	199.4858	194.3230	183.3319	169.4576	156.4177	147.7062	145.6575	150.8203	161.8114	175.6857	188.7256	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	(71)
Water heating gains (Table 5)												
123.2857	121.2626	117.0615	111.3501	107.6420	102.4209	97.9831	103.6691	105.6894	111.6009	118.2759	121.2711	(72)
Total internal gains												
395.0417	393.0990	380.8149	361.0230	341.0099	321.6279	308.9680	314.5737	324.6769	344.6688	367.6490	384.8050	(73)

6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains
		m2	Table 6a	or Table 6b	Specific data	factor	W
			W/m2		or Table 6c	Table 6d	
Northeast		5.1000	11.2829	0.4000	0.8000	0.7700	12.7607 (75)
East		2.2100	19.6403	0.4000	0.8000	0.7700	9.6255 (76)
Southeast		6.2400	36.7938	0.4000	0.8000	0.7700	50.9147 (77)

Solar gains	73.3009	131.5308	196.4709	269.1111	323.4206	330.3715	314.6758	272.9927	221.5768	149.9374	89.0422	61.9089 (83)
Total gains	468.3426	524.6299	577.2858	630.1342	664.4305	651.9994	623.6438	587.5663	546.2537	494.6062	456.6912	446.7139 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	75.2659	75.5069	75.7495	76.9861	77.2383	78.5245	78.5245	78.7868	78.0049	77.2383	76.7356	76.2393
alpha	6.0177	6.0338	6.0500	6.1324	6.1492	6.2350	6.2350	6.2525	6.2003	6.1492	6.1157	6.0826
util living area	0.9963	0.9919	0.9782	0.9283	0.8007	0.5972	0.4357	0.4808	0.7414	0.9497	0.9913	0.9972 (86)
MIT	20.1429	20.2766	20.4867	20.7476	20.9244	20.9899	20.9988	20.9978	20.9643	20.7396	20.3986	20.1217 (87)
Th 2	20.1483	20.1508	20.1533	20.1658	20.1683	20.1808	20.1808	20.1833	20.1758	20.1683	20.1633	20.1583 (88)
util rest of house												
	0.9951	0.9893	0.9713	0.9065	0.7510	0.5255	0.3554	0.3969	0.6700	0.9297	0.9881	0.9963 (89)
MIT 2	19.0046	19.2006	19.5048	19.8764	20.0975	20.1743	20.1803	20.1824	20.1491	19.8743	19.3885	18.9813 (90)
Living area fraction												
MIT	19.4746	19.6449	19.9103	20.2361	20.4389	20.5111	20.5183	20.5191	20.4857	20.2316	19.8056	19.4522 (91)
Temperature adjustment												0.0000
adjusted MIT	19.4746	19.6449	19.9103	20.2361	20.4389	20.5111	20.5183	20.5191	20.4857	20.2316	19.8056	19.4522 (92)
												0.0000
												19.4522 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9939	0.9874	0.9688	0.9086	0.7681	0.5549	0.3886	0.4316	0.6981	0.9315	0.9863	0.9952 (94)
Useful gains	465.4649	518.0003	559.3000	572.5145	510.3269	361.7711	242.3585	253.5944	381.3268	460.7171	450.4322	444.5873 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
	980.9059	950.0848	861.3240	716.4081	550.4693	366.2435	242.7723	254.3648	398.2864	606.7016	805.5749	973.3329 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
	383.4881	290.3608	224.7058	103.6033	29.8660	0.0000	0.0000	0.0000	0.0000	108.6124	255.7027	393.3867 (98)
Space heating												1789.7259 (98)
Space heating per m2												(98) / (4) = 25.5456 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1789.7259 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	2006.2828 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	105.5938 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2028.8148 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2274.3014 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	119.7001 (310b)
Electricity used for heat distribution	45.0588 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	188.4684 (330a)
Total electricity for the above, kWh/year	188.4684 (331)
Electricity for lighting (calculated in Appendix L)	310.9145 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	5005.2610 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1712.2337	0.5190	888.6493 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	227.5696	0.5190	118.1086 (368)
Electrical energy for heat distribution	45.0588	0.5190	23.3855 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1030.1434 (373)
Space and water heating			1030.1434 (376)
Pumps and fans	188.4684	0.5190	97.8151 (378)
Energy for lighting	310.9145	0.5190	161.3646 (379)
Energy saving/generation technologies			
PV Unit	-454.0100	0.5190	-235.6312 (380)
Total CO2, kg/year			1053.6919 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.0400 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		15.0400 ZC1
Total Floor Area	TFA	70.0600
Assumed number of occupants	N	2.2476
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.6996 ZC2
CO2 emissions from cooking, equation (L16)		2.4685 ZC3
Total CO2 emissions		34.2080 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		34.2080 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	70.0600 (1b)	x 2.8000 (2b)	= 196.1680 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.0600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 196.1680 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	+	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				3 * 10 =	30.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.1529 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.4029	(18)
Number of sides sheltered				2	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3425 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4367	0.4281	0.4196	0.3767	0.3682	0.3254	0.3254	0.3168	0.3425	0.3682	0.3853	0.4024 (22b)
Effective ac	0.5953	0.5916	0.5880	0.5710	0.5678	0.5529	0.5529	0.5502	0.5586	0.5678	0.5742	0.5810 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			13.5500	1.3258	17.9640			(27)					
Ground Floor			70.0600	0.1300	9.1078			(28a)					
External Wall	48.1900	13.5500	34.6400	0.1800	6.2352			(29a)					
Corridor	7.5900	1.8900	5.7000	0.1800	1.0260			(29a)					
Unheated	19.4900		19.4900	0.1800	3.5082			(29a)					
Total net area of external elements Aum(A, m2)			145.3300					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.7312			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.5490	(36)					
Total fabric heat loss						(33) + (36) =	49.2802	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 38.5398	Feb 38.3001	Mar 38.0652	Apr 36.9618	May 36.7553	Jun 35.7943	Jul 35.7943	Aug 35.6163	Sep 36.1644	Oct 36.7553	Nov 37.1730	Dec 37.6096	(38)
Heat transfer coeff	87.8200	87.5803	87.3454	86.2420	86.0355	85.0745	85.0745	84.8965	85.4447	86.0355	86.4532	86.8898	(39)
Average = Sum(39)m / 12 =												86.2410	(39)
HLP	Jan 1.2535	Feb 1.2501	Mar 1.2467	Apr 1.2310	May 1.2280	Jun 1.2143	Jul 1.2143	Aug 1.2118	Sep 1.2196	Oct 1.2280	Nov 1.2340	Dec 1.2402	(40)
HLP (average)												1.2310	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2476 (42)
Average daily hot water use (litres/day)												87.5800 (43)
Daily hot water use	96.3380	92.8348	89.3316	85.8284	82.3252	78.8220	78.8220	82.3252	85.8284	89.3316	92.8348	96.3380 (44)
Energy conte	142.8665	124.9520	128.9393	112.4124	107.8623	93.0770	86.2495	98.9726	100.1546	116.7206	127.4096	138.3586 (45)
Energy content (annual)										Total = Sum(45)m =		1377.9751 (45)
Distribution loss (46)m = 0.15 x (45)m												
21.4300	18.7428	19.3409	16.8619	16.1794	13.9616	12.9374	14.8459	15.0232	17.5081	19.1114	20.7538 (46)	
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage												
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
	189.4614	167.0377	175.5342	157.5042	154.4572	138.1688	132.8444	145.5675	145.2465	163.3155	172.5015	184.9535 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	189.4614	167.0377	175.5342	157.5042	154.4572	138.1688	132.8444	145.5675	145.2465	163.3155	172.5015	184.9535 (64)
Heat gains from water heating, kWh/month	84.7790	75.2151	80.1482	73.4506	73.1402	67.0216	65.9539	70.1843	69.3749	76.0855	78.4372	83.2802 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	112.3790	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.7939	15.8044	12.8530	9.7305	7.2737	6.1408	6.6353	8.6248	11.5762	14.6987	17.1555	18.2884	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	197.4371	199.4858	194.3230	183.3319	169.4576	156.4177	147.7062	145.6575	150.8203	161.8114	175.6857	188.7256	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	34.2379	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	-89.9032	(71)
Water heating gains (Table 5)	113.9503	111.9272	107.7261	102.0147	98.3067	93.0855	88.6477	94.3337	96.3540	102.2655	108.9405	111.9357	(72)
Total internal gains	388.8950	386.9312	374.6158	354.7908	334.7516	315.3577	302.7030	308.3297	318.4643	338.4893	361.4955	378.6635	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
Northeast					5.1000	11.2829	0.6300	0.7000	0.7700		17.5859 (75)	
East					2.2100	19.6403	0.6300	0.7000	0.7700		13.2651 (76)	
Southeast					6.2400	36.7938	0.6300	0.7000	0.7700		70.1668 (77)	
Solar gains	101.0178	181.2659	270.7614	370.8688	445.7141	455.2932	433.6626	376.2180	305.3606	206.6324	122.7113	85.3182 (83)
Total gains	489.9128	568.1971	645.3772	725.6596	780.4657	770.6509	736.3655	684.5478	623.8248	545.1217	484.2067	463.9817 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	55.4006	55.5522	55.7016	56.4143	56.5496	57.1885	57.1885	57.3083	56.9407	56.5496	56.2765	55.9937
alpha	4.6934	4.7035	4.7134	4.7610	4.7700	4.8126	4.8126	4.8206	4.7960	4.7700	4.7518	4.7329
util living area	0.9961	0.9916	0.9791	0.9384	0.8368	0.6616	0.4985	0.5535	0.8033	0.9610	0.9920	0.9970 (86)
MIT	19.7125	19.8855	20.1640	20.5210	20.8057	20.9541	20.9904	20.9846	20.8829	20.5098	20.0476	19.6849 (87)
Th 2	19.8774	19.8801	19.8828	19.8953	19.8976	19.9086	19.9086	19.9106	19.9044	19.8976	19.8929	19.8880 (88)
util rest of house	0.9948	0.9888	0.9718	0.9164	0.7824	0.5666	0.3799	0.4309	0.7213	0.9426	0.9888	0.9960 (89)
MIT 2	18.1804	18.4338	18.8376	19.3473	19.7143	19.8796	19.9053	19.9046	19.8152	19.3438	18.6800	18.1475 (90)
Living area fraction									fLA = Living area / (4) =			0.4129 (91)
MIT	18.8130	19.0332	19.3853	19.8320	20.1650	20.3233	20.3534	20.3506	20.2561	19.8253	19.2447	18.7824 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8130	19.0332	19.3853	19.8320	20.1650	20.3233	20.3534	20.3506	20.2561	19.8253	19.2447	18.7824 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9930	0.9859	0.9676	0.9149	0.7969	0.6044	0.4292	0.4818	0.7503	0.9411	0.9862	0.9945	(94)
Useful gains	486.5050	560.2110	624.4888	663.9350	621.9564	465.7687	316.0462	329.8118	468.0326	513.0002	477.5337	461.4414	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1274.5352	1237.7912	1125.4727	942.7931	728.2893	486.9050	319.3147	335.3884	526.0032	793.7002	1049.9508	1267.0589	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	586.2945	455.3339	372.7321	200.7779	79.1116	0.0000	0.0000	0.0000	0.0000	208.8408	412.1403	599.3794	(98)
Space heating												2914.6105	(98)
Space heating per m2												(98) / (4) =	41.6016 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												3117.2304 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	586.2945	455.3339	372.7321	200.7779	79.1116	0.0000	0.0000	0.0000	0.0000	208.8408	412.1403	599.3794 (98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000 (210)
Space heating fuel (main heating system)	627.0529	486.9882	398.6439	214.7357	84.6114	0.0000	0.0000	0.0000	0.0000	223.3591	440.7918	641.0475 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	189.4614	167.0377	175.5342	157.5042	154.4572	138.1688	132.8444	145.5675	145.2465	163.3155	172.5015	184.9535 (64)
Efficiency of water heater (217)m	87.6303	87.3563	86.7748	85.4624	83.1290	79.8000	79.8000	79.8000	79.8000	85.4708	87.0559	79.8000 (216)
Fuel for water heating, kWh/month	216.2053	191.2142	202.2869	184.2965	185.8043	173.1439	166.4717	182.4154	182.0131	191.0776	198.1503	210.8304 (219)
Water heating fuel used												2283.9097 (219)
Annual totals kWh/year												
Space heating fuel - main system												3117.2304 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												314.2458 (232)
Total delivered energy for all uses												5790.3860 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3117.2304	0.2160	673.3218 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2283.9097	0.2160	493.3245 (264)
Space and water heating			1166.6463 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	314.2458	0.5190	163.0936 (268)
Total CO2, kg/m2/year			1368.6649 (272)
Emissions per m2 for space and water heating			16.6521 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3279 (272b)
Emissions per m2 for pumps and fans			0.5556 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.6521 * 1.55) + 2.3279 + 0.5556, rounded to 2 d.p.			28.6900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010542				Issued on Date	29/04/2022
Assessment Reference	108	Prop Type Ref				
Property						
SAP Rating	82 B	DER	15.23	TER	30.13	
Environmental	91 B	% DER<TER	49.46			
CO ₂ Emissions (t/year)	0.62	DFEE	47.31	TFEE	52.61	
General Requirements Compliance	Pass	% DFEE<TFEE	10.07			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Ground-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 30.13 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.23 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 52.6 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 47.3 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room stats OK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing South East:	6.24 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	454.01 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.9000 (1b)	x 2.8000 (2b)	= 142.5200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 142.5200 (5)

2. Ventilation rate

	main heating		secondary heating		other		total	m3 per hour				
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							3	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.7750 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1163 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)					
Ground Floor			50.9000	0.1000	5.0900		(28a)					
External Wall	22.0900	8.4500	13.6400	0.1500	2.0460		(29a)					
Corridor	19.5200	1.8900	17.6300	0.2500	4.4075		(29a)					
Unheated	18.4000		18.4000	0.2000	3.6800		(29a)					
Total net area of external elements Aum(A, m2)			110.9100				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		26.7891		(33)					
Party Wall 1			23.4400	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.2840 (36)					
Total fabric heat loss						(33) + (36) =	36.0731 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 12.4972	Feb 12.3605	Mar 12.2238	Apr 11.5404	May 11.4037	Jun 10.7203	Jul 10.7203	Aug 10.5836	Sep 10.9936	Oct 11.4037	Nov 11.6771	Dec 11.9504 (38)
Heat transfer coeff	48.5703	48.4336	48.2969	47.6135	47.4768	46.7933	46.7933	46.6567	47.0667	47.4768	47.7501	48.0235 (39)
Average = Sum(39)m / 12 =	47.5793 (39)											
HLP	Jan 0.9542	Feb 0.9515	Mar 0.9489	Apr 0.9354	May 0.9327	Jun 0.9193	Jul 0.9193	Aug 0.9166	Sep 0.9247	Oct 0.9327	Nov 0.9381	Dec 0.9435 (40)
HLP (average)	0.9348 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7166 (42)
Average daily hot water use (litres/day)												74.9698 (43)
Daily hot water use	Jan 82.4667	Feb 79.4680	Mar 76.4692	Apr 73.4704	May 70.4716	Jun 67.4728	Jul 67.4728	Aug 70.4716	Sep 73.4704	Oct 76.4692	Nov 79.4680	Dec 82.4667 (44)
Energy conte	122.2958	106.9607	110.3739	96.2266	92.3317	79.6752	73.8308	84.7220	85.7338	99.9145	109.0645	118.4370 (45)
Energy content (annual)												Total = Sum(45)m = 1179.5664 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

18.3444	16.0441	16.5561	14.4340	13.8498	11.9513	11.0746	12.7083	12.8601	14.9872	16.3597	17.7655 (46)
Water storage loss:											
Store volume											110.0000 (47)
b) If manufacturer declared loss factor is not known :											
Hot water storage loss factor from Table 2 (kWh/litre/day)											0.0152 (51)
Volume factor from Table 2a											1.0294 (52)
Temperature factor from Table 2b											0.6000 (53)
Enter (49) or (54) in (55)											1.0327 (55)
Total storage loss											
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage											
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month											
177.5726	156.8881	165.6507	149.7203	147.6085	133.1689	129.1076	139.9988	139.2275	155.1913	162.5582	173.7138 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =											0.0000 (63)
Output from w/h											
177.5726	156.8881	165.6507	149.7203	147.6085	133.1689	129.1076	139.9988	139.2275	155.1913	162.5582	173.7138 (64)
Total per year (kWh/year) = Sum(64)m =											1830.4062 (64)
Heat gains from water heating, kWh/month											
84.8848	75.5064	80.9207	74.7903	74.9217	69.2870	68.7702	72.3915	71.3014	77.4430	79.0589	83.6017 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
85.8311	85.8311	85.8311	85.8311	85.8311	85.8311	85.8311	85.8311	85.8311	85.8311	85.8311	85.8311 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5											
13.5136	12.0027	9.7613	7.3899	5.5240	4.6636	5.0392	6.5502	8.7916	11.1630	13.0288	13.8892 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											
149.5712	151.1232	147.2120	138.8856	128.3749	118.4964	111.8969	110.3448	114.2560	122.5825	133.0931	142.9717 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
31.5831	31.5831	31.5831	31.5831	31.5831	31.5831	31.5831	31.5831	31.5831	31.5831	31.5831	31.5831 (69)
Pumps, fans											
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)											
-68.6649	-68.6649	-68.6649	-68.6649	-68.6649	-68.6649	-68.6649	-68.6649	-68.6649	-68.6649	-68.6649	-68.6649 (71)
Water heating gains (Table 5)											
114.0925	112.3607	108.7644	103.8754	100.7013	96.2319	92.4331	97.3004	99.0298	104.0901	109.8040	112.3679 (72)
Total internal gains											
325.9266	324.2360	314.4871	298.9002	283.3495	268.1412	258.1185	262.9447	270.8267	286.5848	304.6753	317.9782 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
Southeast					6.2400	36.7938	0.4000	0.8000	0.7700		50.9147 (77)	
South					2.2100	46.7521	0.4000	0.8000	0.7700		22.9127 (78)	
Solar gains	73.8274	124.2516	166.4633	201.0539	220.9821	217.6723	210.5612	195.8614	178.4200	136.3256	88.1434	63.3710 (83)
Total gains	399.7540	448.4876	480.9504	499.9541	504.3316	485.8136	468.6797	458.8061	449.2467	422.9104	392.8187	381.3492 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)											21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	72.7755	72.9808	73.1874	74.2379	74.4516	75.5390	75.5390	75.7603	75.1003	74.4516	74.0254
alpha	5.8517	5.8654	5.8792	5.9492	5.9634	6.0359	6.0359	6.0507	6.0067	5.9634	5.9350
util living area	0.9919	0.9831	0.9628	0.9093	0.7938	0.6033	0.4376	0.4653	0.6911	0.9137	0.9814
MIT											0.9937 (86)
20.2067	20.3513	20.5456	20.7666	20.9209	20.9877	20.9984	20.9978	20.9725	20.7937	20.4660	20.1797 (87)
Th 2	20.1217	20.1239	20.1262	20.1375	20.1398	20.1511	20.1511	20.1534	20.1466	20.1398	20.1352
util rest of house											20.1307 (88)
0.9894	0.9781	0.9518	0.8835	0.7426	0.5289	0.3541	0.3810	0.6179	0.8840	0.9750	0.9917 (89)
MIT 2	19.0765	19.2864	19.5642	19.8749	20.0662	20.1432	20.1505	20.1525	20.1268	19.9173	19.4621
Living area fraction											19.0444 (90)
19.6416	19.8188	20.0549	20.3208	20.4935	20.5654	20.5745	20.5751	20.5497	20.3555	19.9641	19.6120 (92)
Temperature adjustment											0.0000
adjusted MIT	19.6416	19.8188	20.0549	20.3208	20.4935	20.5654	20.5745	20.5751	20.5497	20.3555	19.6120 (93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9877	0.9760	0.9508	0.8895	0.7647	0.5658	0.3959	0.4232	0.6535	0.8923	0.9734
Useful gains	394.8402	437.7079	457.2880	444.6939	385.6563	274.8671	185.5552	194.1673	293.5777	377.3470	382.3773
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000
Heat loss rate W											740.1401 (97)
745.1459	722.5727	654.6607	543.7824	417.4873	279.1429	185.9795	194.7974	303.5646	463.1610	614.2618	740.1401 (97)
Month fracti											1.0000 (97a)
1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh											1194.4360 (98)
260.6274	191.4291	146.8453	71.3437	23.6823	0.0000	0.0000	0.0000	0.0000	63.8456	166.9568	269.7058 (98)
Space heating											1194.4360 (98)
Space heating per m2											(98) / (4) = 23.4663 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump	0.9500	(303a)
Fraction of heat from community Boilers	0.0500	(303b)
Fraction of total space heat from community Heat pump	0.9500	(304a)
Fraction of total space heat from community Boilers	0.0500	(304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.1800	(306)
Space heating:		
Annual space heating requirement	1194.4360	(98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1338.9628	(307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	70.4717	(307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1830.4062	(64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2051.8853	(310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	107.9940	(310b)
Electricity used for heat distribution	35.6931	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)		
mechanical ventilation fans (SFP = 0.7875)	136.9261	(330a)
Total electricity for the above, kWh/year	136.9261	(331)
Electricity for lighting (calculated in Appendix L)	238.6552	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
Total delivered energy for all uses	3944.8951	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			250.0000	(367a)
Space heating from Heat pump	1356.3392	0.5190	703.9401	(367)
Efficiency of heat source Boilers			99.0000	(367b)
Space heating from Boilers	180.2684	0.5190	93.5593	(368)
Electrical energy for heat distribution	35.6931	0.5190	18.5247	(372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			816.0241	(373)
Space and water heating			816.0241	(376)
Pumps and fans	136.9261	0.5190	71.0646	(378)
Energy for lighting	238.6552	0.5190	123.8621	(379)
Energy saving/generation technologies				
PV Unit	-454.0100	0.5190	-235.6312	(380)
Total CO2, kg/year			775.3196	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.2300	(384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		15.2300	ZC1
Total Floor Area	TFA	50.9000	
Assumed number of occupants	N	1.7166	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.4131	ZC2
CO2 emissions from cooking, equation (L16)		3.1473	ZC3
Total CO2 emissions		35.7904	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		35.7904	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.9000 (1b)	x 2.8000 (2b)	= 142.5200 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.9000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 142.5200 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					20.0000 / (5) = 0.1403 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3903 (18)
					3 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3025 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.3857	0.3781	0.3706	0.3328	0.3252	0.2874	0.2874	0.2798	0.3025	0.3252	0.3403	0.3554 (22b)
Effective ac	0.5744	0.5715	0.5687	0.5554	0.5529	0.5413	0.5413	0.5391	0.5458	0.5529	0.5579	0.5632 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)					
Ground Floor			50.9000	0.1300	6.6170		(28a)					
External Wall	22.0900	8.4500	13.6400	0.1800	2.4552		(29a)					
Corridor	19.5200	1.8900	17.6300	0.1800	3.1734		(29a)					
Unheated	18.4000		18.4000	0.1800	3.3120		(29a)					
Total net area of external elements Aum(A, m2)			110.9100				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.6503		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.7195 (36)					
Total fabric heat loss						(33) + (36) =	36.3698 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	27.0140	26.8782	26.7451	26.1196	26.0026	25.4579	25.4579	25.3571	25.6677	26.0026	26.2393	26.4868 (38)
Heat transfer coeff	63.3838	63.2480	63.1148	62.4894	62.3724	61.8277	61.8277	61.7268	62.0375	62.3724	62.6091	62.8566 (39)
Average = Sum(39)m / 12 =												62.4888 (39)
HLP	1.2453	1.2426	1.2400	1.2277	1.2254	1.2147	1.2147	1.2127	1.2188	1.2254	1.2300	1.2349 (40)
HLP (average)												1.2277 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7166 (42)
Average daily hot water use (litres/day)												74.9698 (43)
Daily hot water use	82.4667	79.4680	76.4692	73.4704	70.4716	67.4728	67.4728	70.4716	73.4704	76.4692	79.4680	82.4667 (44)
Energy conte	122.2958	106.9607	110.3739	96.2266	92.3317	79.6752	73.8308	84.7220	85.7338	99.9145	109.0645	118.4370 (45)
Energy content (annual)										Total = Sum(45)m =		1179.5664 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	18.3444	16.0441	16.5561	14.4340	13.8498	11.9513	11.0746	12.7083	12.8601	14.9872	16.3597	17.7655 (46)
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	168.8907	149.0464	156.9688	141.3184	138.9266	124.7671	120.4257	131.3169	130.8256	146.5094	154.1563	165.0319 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	168.8907	149.0464	156.9688	141.3184	138.9266	124.7671	120.4257	131.3169	130.8256	146.5094	154.1563	165.0319 (64)
Heat gains from water heating, kWh/month	77.9393	69.2330	73.9752	68.0688	67.9762	62.5655	61.8247	65.4460	64.5800	70.4975	72.3374	76.6562 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	85.8311	85.8311	85.8311	85.8311	85.8311	85.8311	85.8311	85.8311	85.8311	85.8311	85.8311	85.8311	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.8129	12.2685	9.9774	7.5536	5.6464	4.7669	5.1508	6.6952	8.9863	11.4102	13.3174	14.1968	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.5712	151.1232	147.2120	138.8856	128.3749	118.4964	111.8969	110.3448	114.2560	122.5825	133.0931	142.9717	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5831	31.5831	31.5831	31.5831	31.5831	31.5831	31.5831	31.5831	31.5831	31.5831	31.5831	31.5831	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.6649	-68.6649	-68.6649	-68.6649	-68.6649	-68.6649	-68.6649	-68.6649	-68.6649	-68.6649	-68.6649	-68.6649	(71)
Water heating gains (Table 5)	104.7571	103.0253	99.4291	94.5400	91.3659	86.8965	83.0977	87.9650	89.6944	94.7547	100.4686	103.0325	(72)
Total internal gains	319.8905	318.1664	308.3679	292.7285	277.1365	261.9091	251.8947	256.7544	264.6860	280.4967	298.6285	311.9504	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
Southeast					6.2400	36.7938	0.6300	0.7000			0.7700	70.1668 (77)
South					2.2100	46.7521	0.6300	0.7000			0.7700	31.5766 (78)
Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains	421.6339	489.4006	537.7751	569.8059	581.6774	561.8888	542.0744	526.6759	510.5711	468.3704	420.1011	399.2836 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	55.7670	55.8867	56.0046	56.5652	56.6713	57.1706	57.1706	57.2640	56.9772	56.6713	56.4570	56.2347
alpha	4.7178	4.7258	4.7336	4.7710	4.7781	4.8114	4.8114	4.8176	4.7985	4.7781	4.7638	4.7490
util living area	0.9921	0.9835	0.9651	0.9206	0.8258	0.6599	0.4926	0.5261	0.7476	0.9308	0.9837	0.9938 (86)
MIT	19.8389	20.0256	20.2808	20.5787	20.8185	20.9546	20.9909	20.9875	20.9155	20.6129	20.1688	19.8023 (87)
Th 2	19.8840	19.8861	19.8882	19.8979	19.8997	19.9083	19.9083	19.9098	19.9050	19.8997	19.8960	19.8922 (88)
util rest of house	0.9896	0.9782	0.9537	0.8943	0.7698	0.5650	0.3752	0.4080	0.6605	0.9023	0.9775	0.9918 (89)
MIT 2	18.3685	18.6394	19.0051	19.4244	19.7301	19.8796	19.9051	19.9051	19.8439	19.4800	18.8559	18.3211 (90)
Living area fraction									fLA = Living area / (4) =			0.5000 (91)
MIT	19.1037	19.3325	19.6430	20.0015	20.2743	20.4171	20.4480	20.4463	20.3797	20.0465	19.5124	19.0617 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1037	19.3325	19.6430	20.0015	20.2743	20.4171	20.4480	20.4463	20.3797	20.0465	19.5124	19.0617 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9872	0.9749	0.9507	0.8971	0.7905	0.6110	0.4342	0.4673	0.7006	0.9067	0.9747	0.9898	(94)
Ext temp.	416.2476	477.1239	511.2550	511.1635	459.7921	343.3036	235.3523	246.1083	357.7226	424.6916	409.4918	395.2157	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	938.3139	912.8278	829.5152	693.7286	534.7977	359.6565	237.9130	249.7648	389.5749	589.1978	777.1272	934.1564	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m ²	388.4174	292.7930	236.7855	131.4469	55.8041	0.0000	0.0000	0.0000	0.0000	122.3926	264.6975	400.9719	(98)
												1893.3090	(98)
												37.1966	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2024.9294 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	388.4174	292.7930	236.7855	131.4469	55.8041	0.0000	0.0000	0.0000	0.0000	122.3926	264.6975	400.9719	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	415.4197	313.1476	253.2466	140.5849	59.6836	0.0000	0.0000	0.0000	0.0000	130.9012	283.0989	428.8470	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.8907	149.0464	156.9688	141.3184	138.9266	124.7671	120.4257	131.3169	130.8256	146.5094	154.1563	165.0319	(64)
Efficiency of water heater (217)m	86.9662	86.5837	85.9080	84.6214	82.5986	79.8000	79.8000	79.8000	79.8000	84.3386	86.2439	87.0950	(216)
Fuel for water heating, kWh/month	194.2027	172.1414	182.7173	167.0008	168.1949	156.3497	150.9094	164.5575	163.9419	173.7157	178.7445	189.4850	(219)
Water heating fuel used												2061.9607	(219)
Annual totals kWh/year													
Space heating fuel - main system												2024.9294	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.9409	(232)
Total delivered energy for all uses												4405.8310	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2024.9294	0.2160	437.3848 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2061.9607	0.2160	445.3835 (264)
Space and water heating			882.7683 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.9409	0.5190	126.6053 (268)
Total CO2, kg/m2/year			1048.2986 (272)
Emissions per m2 for space and water heating			17.3432 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4873 (272b)
Emissions per m2 for pumps and fans			0.7647 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.3432 * 1.55) + 2.4873 + 0.7647, rounded to 2 d.p.			30.1300 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010543			Issued on Date	29/04/2022
Assessment Reference	109	Prop Type Ref			
Property					
SAP Rating	80 C	DER	17.99	TER	30.63
Environmental	89 B	% DER<TER	41.27		
CO ₂ Emissions (t/year)	0.73	DFEE	57.66	TFEE	54.20
General Requirements Compliance	Fail	% DFEE<TFEE	-6.39		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Ground-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 30.63 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.99 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)54.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)57.7 kWh/m²/yrFail
Excess energy =3.5 kWh/m²/yr (6.5%)

2 Fabric U-values

Element	Average	Highest	
External wall	0.22 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system:	Community heating scheme	-

Secondary heating system:

None

5 Cylinder insulation

Hot water storage	No cylinder

6 Controls

Space heating controls:	Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:	No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system	
Specific fan power:	0.63
Maximum	1.5 OK
MVHR efficiency:	90%
Minimum:	70% OK

9 Summertime temperature

Overheating risk (Thames Valley):	Medium OK

Based on:

Overshading:	Average
Windows facing South East:	6.24 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	454.01 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7500 (1b)	x 2.8000 (2b)	= 142.1000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 142.1000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)
Ground Floor			50.7500	0.1000	5.0750		(28a)
External Wall	25.7600	8.4500	17.3100	0.1500	2.5965		(29a)
Corridor	39.2300	1.8900	37.3400	0.2500	9.3350		(29a)
Total net area of external elements Aum(A, m2)			115.7400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		28.5721		(33)
Party Wall 1			18.4000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.3776 (36)
Total fabric heat loss						(33) + (36) =	44.9497 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	12.4603	12.3241	12.1878	11.5064	11.3701	10.6887	10.6887	10.5524	10.9612	11.3701	11.6427	11.9152 (38)
Heat transfer coeff	57.4100	57.2737	57.1375	56.4560	56.3198	55.6383	55.6383	55.5021	55.9109	56.3198	56.5923	56.8649 (39)
Average = Sum(39)m / 12 =												56.4220 (39)
HLP	1.1312	1.1285	1.1259	1.1124	1.1097	1.0963	1.0963	1.0936	1.1017	1.1097	1.1151	1.1205 (40)
HLP (average)												1.1118 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7122 (42)
Average daily hot water use (litres/day)												74.8647 (43)
Daily hot water use	82.3512	79.3566	76.3620	73.3674	70.3728	67.3783	67.3783	70.3728	73.3674	76.3620	79.3566	82.3512 (44)
Energy conte	122.1245	106.8108	110.2192	96.0918	92.2023	79.5636	73.7274	84.6032	85.6137	99.7745	108.9117	118.2710 (45)
Energy content (annual)												Total = Sum(45)m = 1177.9137 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3187	16.0216	16.5329	14.4138	13.8304	11.9345	11.0591	12.6905	12.8421	14.9662	16.3367	17.7407 (46)

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	177.4013	156.7383	165.4960	149.5855	147.4791	133.0573	129.0042	139.8801	139.1074	155.0513	162.4053	173.5478	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum (63)m =													0.0000 (63)
Output from w/h	177.4013	156.7383	165.4960	149.5855	147.4791	133.0573	129.0042	139.8801	139.1074	155.0513	162.4053	173.5478	(64)
Total per year (kWh/year) = Sum (64)m =													1828.7535 (64)
Heat gains from water heating, kWh/month													
	84.8278	75.4565	80.8693	74.7455	74.8787	69.2498	68.7358	72.3520	71.2615	77.3965	79.0081	83.5466	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.4731	11.9667	9.7320	7.3677	5.5075	4.6496	5.0241	6.5305	8.7652	11.1295	12.9897	13.8476 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.1817	150.7297	146.8287	138.5239	128.0406	118.1878	111.6055	110.0575	113.9585	122.2633	132.7466	142.5994 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880 (71)
Water heating gains (Table 5)	114.0159	112.2865	108.6953	103.8131	100.6434	96.1803	92.3868	97.2473	98.9743	104.0275	109.7334	112.2938 (72)
Total internal gains	325.3537	323.6659	313.9390	298.3878	282.8745	267.7008	257.6994	262.5183	270.3810	286.1032	304.1527	317.4237 (73)

[Jan					Area	Solar flux		g		FF		Access		Gains
					m2	Table 6a		Table 6b		Table 6c		factor		W
						W/m2		or Table 6b		or Table 6c		Table 6d		

Southeast					6.2400	36.7938		0.4000		0.8000		0.7700		50.9147 (77)
South					2.2100	46.7521		0.4000		0.8000		0.7700		22.9127 (78)

Solar gains	73.8274	124.2516	166.4633	201.0539	220.9821	217.6723	210.5612	195.8614	178.4200	136.3256	88.1434	63.3710 (83)		
Total gains	399.1810	447.9175	480.4023	499.4417	503.8566	485.3731	468.2606	458.3797	448.8010	422.4288	392.2961	380.7947 (84)		

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil/m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.3883	61.5344	61.6812	62.4257	62.5767	63.3431	63.3431	63.4986	63.0343	62.5767	62.2753	61.9768
alpha	5.0926	5.1023	5.1121	5.1617	5.1718	5.2229	5.2229	5.2332	5.2023	5.1718	5.1517	5.1318
util living area	0.9932	0.9869	0.9731	0.9375	0.8538	0.6883	0.5142	0.5451	0.7693	0.9407	0.9859	0.9946 (86)
MIT	19.9559	20.1082	20.3290	20.5996	20.8255	20.9589	20.9925	20.9898	20.9244	20.6489	20.2553	19.9272 (87)
Th 2	19.9754	19.9776	19.9798	19.9907	19.9929	20.0038	20.0038	20.0060	19.9995	19.9929	19.9885	19.9841 (88)
util rest of house	0.9911	0.9828	0.9643	0.9162	0.8046	0.5991	0.4023	0.4334	0.6889	0.9161	0.9806	0.9929 (89)
MIT 2	18.6038	18.8257	19.1442	19.5307	19.8246	19.9768	20.0011	20.0020	19.9429	19.6052	19.0483	18.5685 (90)
Living area fraction									fLA = Living area / (4) =			0.5007 (91)
MIT	19.2808	19.4678	19.7374	20.0659	20.3257	20.4685	20.4975	20.4966	20.4343	20.1277	19.6526	19.2488 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2808	19.4678	19.7374	20.0659	20.3257	20.4685	20.4975	20.4966	20.4343	20.1277	19.6526	19.2488 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9891	0.9802	0.9618	0.9180	0.8223	0.6424	0.4586	0.4896	0.7261	0.9200	0.9784	0.9912 (94)
Useful gains	394.8493	439.0378	462.0365	458.5003	414.3220	311.7874	214.7429	224.4100	325.8605	388.6257	383.8323	377.4573 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	860.0487	834.3519	756.3511	630.3826	485.7987	326.5137	216.8492	227.3692	354.1579	536.5997	710.3815	855.7494 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	346.1084	265.6511	218.9700	123.7552	53.1786	0.0000	0.0000	0.0000	0.0000	110.0927	235.1154	355.8494 (98)
Space heating												1708.7207 (98)
Space heating per m2												33.6694 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1708.7207 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1915.4760 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	100.8145 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1828.7535 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2050.0326 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	107.8965 (310b)
Electricity used for heat distribution	41.7422 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	136.5226 (330a)
Total electricity for the above, kWh/year	136.5226 (331)
Electricity for lighting (calculated in Appendix L)	237.9395 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	4548.6817 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1586.2034	0.5190	823.2396 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	210.8192	0.5190	109.4151 (368)
Electrical energy for heat distribution	41.7422	0.5190	21.6642 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			954.3189 (373)
Space and water heating			954.3189 (376)
Pumps and fans	136.5226	0.5190	70.8552 (378)
Energy for lighting	237.9395	0.5190	123.4906 (379)
Energy saving/generation technologies			
PV Unit	-454.0100	0.5190	-235.6312 (380)
Total CO2, kg/year			913.0336 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			17.9900 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		17.9900 ZC1
Total Floor Area	TFA	50.7500
Assumed number of occupants	N	1.7122
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.4191 ZC2
CO2 emissions from cooking, equation (L16)		3.1545 ZC3
Total CO2 emissions		38.5636 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		38.5636 ZC8

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7500 (1b)	x 2.8000 (2b)	= 142.1000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 142.1000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1407 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3907 (18)
					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3028 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.3861	0.3785	0.3710	0.3331	0.3255	0.2877	0.2877	0.2801	0.3028	0.3255	0.3407	0.3558 (22b)
	0.5745	0.5716	0.5688	0.5555	0.5530	0.5414	0.5414	0.5392	0.5459	0.5530	0.5580	0.5633 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)
Ground Floor			50.7500	0.1300	6.5975		(28a)
External Wall	25.7600	8.4500	17.3100	0.1800	3.1158		(29a)
Corridor	39.2300	1.8900	37.3400	0.1800	6.7212		(29a)
Total net area of external elements Aum(A, m ²)			115.7400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.5272		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.9849 (36)
Total fabric heat loss						(33) + (36) =	37.5121 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	26.9419	26.8061	26.6731	26.0482	25.9313	25.3870	25.3870	25.2862	25.5967	25.9313	26.1678	26.4151 (38)
Heat transfer coeff	64.4539	64.3182	64.1851	63.5602	63.4433	62.8991	62.8991	62.7983	63.1087	63.4433	63.6798	63.9271 (39)
Average = Sum(39)m / 12 =												63.5597 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2700	1.2674	1.2647	1.2524	1.2501	1.2394	1.2394	1.2374	1.2435	1.2501	1.2548	1.2596 (40)
HLP (average)												1.2524 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7122 (42)
Average daily hot water use (litres/day)												74.8647 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	82.3512	79.3566	76.3620	73.3674	70.3728	67.3783	67.3783	70.3728	73.3674	76.3620	79.3566	82.3512 (44)
Energy conte	122.1245	106.8108	110.2192	96.0918	92.2023	79.5636	73.7274	84.6032	85.6137	99.7745	108.9117	118.2710 (45)
Energy content (annual)												Total = Sum(45)m = 1177.9137 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3187	16.0216	16.5329	14.4138	13.8304	11.9345	11.0591	12.6905	12.8421	14.9662	16.3367	17.7407 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	168.7194	148.8965	156.8141	141.1836	138.7972	124.6555	120.3223	131.1982	130.7055	146.3694	154.0035	164.8659 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	168.7194	148.8965	156.8141	141.1836	138.7972	124.6555	120.3223	Solar input (sum of months) = Sum(63)m =			0.0000 (63)	
Heat gains from water heating, kWh/month	77.8823	69.1832	73.9238	68.0240	67.9332	62.5284	61.7903	65.4065	64.5400	70.4509	72.2866	76.6010 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	85.6100	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7694	12.2298	9.9460	7.5297	5.6286	4.7519	5.1346	6.6741	8.9580	11.3742	13.2754	14.1520	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.1817	150.7297	146.8287	138.5239	128.0406	118.1878	111.6055	110.0575	113.9585	122.2633	132.7466	142.5994	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	31.5610	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	-68.4880	(71)
Water heating gains (Table 5)	104.6805	102.9512	99.3600	94.4778	91.3081	86.8450	83.0514	87.9120	89.6389	94.6921	100.3981	102.9584	(72)
Total internal gains	319.3145	317.5937	307.8176	292.2144	276.6602	261.4676	251.4745	256.3265	264.2383	280.0126	298.1030	311.3928	(73)

6. Solar gains

[Jan]												Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W
Southeast												6.2400	36.7938	0.6300	0.7000	0.7700	70.1668 (77)
South												2.2100	46.7521	0.6300	0.7000	0.7700	31.5766 (78)
Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)					
Total gains	421.0579	488.8279	537.2248	569.2918	581.2011	561.4473	541.6542	526.2480	510.1234	467.8863	419.5756	398.7260 (84)					

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	54.6795	54.7949	54.9084	55.4483	55.5505	56.0311	56.0311	56.1211	55.8450	55.5505	55.3441	55.1301	
alpha	4.6453	4.6530	4.6606	4.6966	4.7034	4.7354	4.7354	4.7414	4.7230	4.7034	4.6896	4.6753	
util living area	0.9922	0.9837	0.9658	0.9228	0.8308	0.6677	0.5003	0.5340	0.7543	0.9328	0.9839	0.9939	(86)
MIT	19.8073	19.9951	20.2535	20.5573	20.8053	20.9496	20.9895	20.9857	20.9078	20.5940	20.1423	19.7704	(87)
Th 2	19.8644	19.8665	19.8686	19.8783	19.8801	19.8886	19.8886	19.8902	19.8853	19.8801	19.8764	19.8726	(88)
util rest of house	0.9896	0.9785	0.9546	0.8968	0.7750	0.5712	0.3794	0.4126	0.6665	0.9046	0.9778	0.9919	(89)
MIT 2	18.3088	18.5813	18.9520	19.3801	19.6976	19.8567	19.8850	19.8848	19.8185	19.4396	18.8037	18.2611	(90)
Living area fraction	19.0590	19.2892	19.6037	19.9695	20.2522	20.4039	20.4380	20.4360	20.3639	20.0176	19.4739	19.0168	(91)
MIT	19.0590	19.2892	19.6037	19.9695	20.2522	20.4039	20.4380	20.4360	20.3639	20.0176	19.4739	19.0168	(92)
Temperature adjustment	19.0590	19.2892	19.6037	19.9695	20.2522	20.4039	20.4380	20.4360	20.3639	20.0176	19.4739	19.0168	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	415.6802	476.6664	511.1353	511.9442	462.1514	346.8911	238.4663	249.2794	360.5454	425.1555	409.0734	394.6543	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	951.2783	925.4845	841.0610	703.5807	542.5804	365.0605	241.4091	253.4552	395.3068	597.4835	787.9684	947.1956	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	398.4850	301.6058	245.4647	137.9782	59.8391	0.0000	0.0000	0.0000	0.0000	128.2120	272.8044	411.0907	(98)
Space heating													1955.4800 (98)
Space heating per m2													(98) / (4) = 38.5316 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												2091.4224 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	398.4850	301.6058	245.4647	137.9782	59.8391	0.0000	0.0000	0.0000	0.0000	128.2120	272.8044	411.0907 (98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000 (210)
Space heating fuel (main heating system)	426.1871	322.5730	262.5291	147.5703	63.9991	0.0000	0.0000	0.0000	0.0000	137.1252	291.7694	439.6692 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	168.7194	148.8965	156.8141	141.1836	138.7972	124.6555	120.3223	131.1982	130.7055	146.3694	154.0035	164.8659 (64)
Efficiency of water heater (217)m	87.0289	86.6595	86.0047	84.7527	82.7472	79.8000	79.8000	79.8000	79.8000	84.4629	86.3235	79.8000 (216)
Fuel for water heating, kWh/month	193.8659	171.8179	182.3321	166.5830	167.7364	156.2098	150.7798	164.4087	163.7914	173.2942	178.4027	189.1643 (219)
Water heating fuel used												2058.3862 (219)
Annual totals kWh/year												
Space heating fuel - main system												2091.4224 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												243.1711 (232)
Total delivered energy for all uses												4467.9798 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2091.4224	0.2160	451.7472 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2058.3862	0.2160	444.6114 (264)
Space and water heating			896.3587 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.1711	0.5190	126.2058 (268)
Total CO2, kg/m2/year			1061.4895 (272)
Emissions per m2 for space and water heating			17.6622 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4868 (272b)
Emissions per m2 for pumps and fans			0.7670 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.6622 * 1.55) + 2.4868 + 0.7670, rounded to 2 d.p.			30.6300 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010544			Issued on Date	29/04/2022
Assessment Reference	110	Prop Type Ref			
Property					
SAP Rating	83 B	DER	14.48	TER	27.46
Environmental	90 B	% DER<TER	47.28		
CO ₂ Emissions (t/year)	0.84	DFEE	45.80	TFEE	53.66
General Requirements Compliance	Pass	% DFEE<TFEE	14.65		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Ground-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 27.46 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.48 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)53.7 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)45.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing South East:	6.24 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Windows facing South West:	3.92 m ² , No overhang
Windows facing West:	1.37 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	454.01 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.4200 (1b)	x 2.8000 (2b)	= 205.5760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 205.5760 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			13.7400	1.1450	15.7328		(27)
Ground Floor			73.4200	0.1000	7.3420		(28a)
External Wall	59.0000	13.7400	45.2600	0.1500	6.7890		(29a)
Corridor	7.6200	1.8900	5.7300	0.2500	1.4325		(29a)
Unheated	17.1100		17.1100	0.2000	3.4220		(29a)
Total net area of external elements Aum(A, m2)			157.1500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.6083		(33)
Party Wall 1			20.5200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.4738 (36)
Total fabric heat loss							(33) + (36) = 49.0821 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	18.9995	18.7832	18.5670	17.4858	17.2695	16.1883	16.1883	15.9721	16.6208	17.2695	17.7020	18.1345 (38)
Heat transfer coeff	68.0816	67.8653	67.6491	66.5679	66.3517	65.2705	65.2705	65.0542	65.7029	66.3517	66.7841	67.2166 (39)
Average = Sum(39)m / 12 =												66.5138 (39)
HLP	0.9273	0.9243	0.9214	0.9067	0.9037	0.8890	0.8890	0.8861	0.8949	0.9037	0.9096	0.9155 (40)
HLP (average)												0.9059 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3262 (42)
Average daily hot water use (litres/day)												89.4475 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	98.3923	94.8144	91.2365	87.6586	84.0807	80.5028	80.5028	84.0807	87.6586	91.2365	94.8144	98.3923 (44)
Energy conte	145.9129	127.6164	131.6887	114.8094	110.1623	95.0617	88.0886	101.0830	102.2903	119.2094	130.1264	141.3089 (45)
Energy content (annual)											Total = Sum (45)m =	1407.3579 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	21.8869	19.1425	19.7533	17.2214	16.5243	14.2593	13.2133	15.1625	15.3435	17.8814	19.5190	21.1963 (46)
Water storage loss:												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
201.1897	177.5438	186.9655	168.3030	165.4391	148.5554	143.3654	156.3598	155.7839	174.4862	183.6201	196.5857	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
201.1897	177.5438	186.9655	168.3030	165.4391	148.5554	143.3654	156.3598	155.7839	174.4862	183.6201	196.5857	(64)
Heat gains from water heating, kWh/month												
92.7375	82.3744	88.0079	80.9691	80.8504	74.4030	73.5109	77.8315	76.8065	83.8586	86.0620	91.2066	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	116.3106	116.3106	116.3106	116.3106	116.3106	116.3106	116.3106	116.3106	116.3106	116.3106	116.3106	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
18.3178	16.2697	13.2314	10.0170	7.4878	6.3215	6.8307	8.8787	11.9170	15.1314	17.6606	18.8269	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
205.1440	207.2728	201.9084	190.4882	176.0723	162.5234	153.4719	151.3432	156.7076	168.1277	182.5436	196.0925	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.6311	34.6311	34.6311	34.6311	34.6311	34.6311	34.6311	34.6311	34.6311	34.6311	34.6311	34.6311	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-93.0485	-93.0485	-93.0485	-93.0485	-93.0485	-93.0485	-93.0485	-93.0485	-93.0485	-93.0485	-93.0485	-93.0485	(71)
Water heating gains (Table 5)												
124.6472	122.5809	118.2902	112.4570	108.6699	103.3374	98.8050	104.6123	106.6756	112.7131	119.5305	122.5896	(72)
Total internal gains												
406.0021	404.0165	391.3231	370.8554	350.1232	330.0756	317.0008	322.7274	333.1934	353.8654	377.6279	395.4021	(73)

6. Solar gains

[Jan]					Area	Solar flux	g	FF			Access	Gains
					m2	Table 6a	Specific data	Specific data			factor	W
						W/m2	or Table 6b	or Table 6c			Table 6d	
Southeast					6.2400	36.7938	0.4000	0.8000			0.7700	50.9147 (77)
South					2.2100	46.7521	0.4000	0.8000			0.7700	22.9127 (78)
Southwest					3.9200	36.7938	0.4000	0.8000			0.7700	31.9848 (79)
West					1.3700	19.6403	0.4000	0.8000			0.7700	5.9669 (80)

Solar gains	111.7791	190.4062	260.2311	321.4541	358.7968	355.5525	343.0680	315.3716	281.4934	210.3904	133.8939	95.6503 (83)
Total gains	517.7812	594.4228	651.5542	692.3096	708.9201	685.6281	660.0688	638.0989	614.6868	564.2558	511.5218	491.0524 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.8897	75.1283	75.3685	76.5926	76.8422	78.1151	78.1151	78.3748	77.6010	76.8422	76.3446	75.8534
alpha	5.9926	6.0086	6.0246	6.1062	6.1228	6.2077	6.2077	6.2250	6.1734	6.1228	6.0896	6.0569
util living area	0.9951	0.9881	0.9697	0.9154	0.7936	0.5980	0.4337	0.4667	0.7042	0.9302	0.9879	0.9963 (86)
MIT	20.1711	20.3259	20.5341	20.7702	20.9271	20.9896	20.9988	20.9981	20.9725	20.7788	20.4342	20.1448 (87)
Th 2	20.1444	20.1469	20.1493	20.1618	20.1643	20.1769	20.1769	20.1794	20.1718	20.1643	20.1593	20.1543 (88)
util rest of house	0.9936	0.9845	0.9606	0.8911	0.7434	0.5260	0.3533	0.3847	0.6325	0.9048	0.9836	0.9952 (89)
MIT 2	19.0425	19.2685	19.5678	19.9015	20.0964	20.1702	20.1764	20.1786	20.1519	19.9209	19.4363	19.0120 (90)
Living area fraction									fLA = Living area / (4) =			0.3909 (91)
MIT	19.4837	19.6819	19.9455	20.2411	20.4211	20.4905	20.4979	20.4989	20.4727	20.2563	19.8264	19.4548 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4837	19.6819	19.9455	20.2411	20.4211	20.4905	20.4979	20.4989	20.4727	20.2563	19.8264	19.4548 (93)

8. Space heating requirement

Utilisation	0.9920	0.9820	0.9580	0.8936	0.7597	0.5539	0.3848	0.4168	0.6595	0.9080	0.9814	0.9939 (94)
Useful gains	513.6464	583.7131	624.1571	618.6699	538.5392	379.7458	253.9937	265.9718	405.3791	512.3221	502.0136	488.0757 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
1033.7291	1003.1764	909.5755	754.9517	578.6610	384.4756	254.4147	266.6523	418.7032	640.7092	849.9196	1025.3769	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh												
386.9415	281.8793	212.3513	98.1229	29.8506	0.0000	0.0000	0.0000	0.0000	95.5200	250.4923	399.7521	(98)
Space heating												1754.9101 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating per m2 (98) / (4) = 23.9023 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1754.9101 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1967.2542 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	103.5397 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2058.1977 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2307.2396 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	121.4337 (310b)
Electricity used for heat distribution	44.9947 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	197.5071 (330a)
Total electricity for the above, kWh/year	197.5071 (331)
Electricity for lighting (calculated in Appendix L)	323.4974 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	5020.4717 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1709.7975	0.5190	887.3849 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	227.2458	0.5190	117.9406 (368)
Electrical energy for heat distribution	44.9947	0.5190	23.3522 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1028.6777 (373)
Space and water heating			1028.6777 (376)
Pumps and fans	197.5071	0.5190	102.5062 (378)
Energy for lighting	323.4974	0.5190	167.8951 (379)
Energy saving/generation technologies			
PV Unit	-454.0100	0.5190	-235.6312 (380)
Total CO2, kg/year			1063.4479 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.4800 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			14.4800 ZC1
Total Floor Area		TFA	73.4200
Assumed number of occupants		N	2.3262
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.5573 ZC2
CO2 emissions from cooking, equation (L16)			2.3812 ZC3
Total CO2 emissions			33.4186 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			33.4186 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.4200 (1b)	x 2.8000 (2b)	= 205.5760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 205.5760 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					30.0000 / (5) = 0.1459 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3959 (18)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3365 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4291	0.4207	0.4123	0.3702	0.3618	0.3197	0.3197	0.3113	0.3365	0.3618	0.3786	0.3954 (22b)
	0.5921	0.5885	0.5850	0.5685	0.5654	0.5511	0.5511	0.5485	0.5566	0.5654	0.5717	0.5782 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			13.7400	1.3258	18.2159			(27)					
Ground Floor			73.4200	0.1300	9.5446			(28a)					
External Wall	59.0000	13.7400	45.2600	0.1800	8.1468			(29a)					
Corridor	7.6200	1.8900	5.7300	0.1800	1.0314			(29a)					
Unheated	17.1100		17.1100	0.1800	3.0798			(29a)					
Total net area of external elements Aum(A, m2)			157.1500					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		41.9085			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.5544	(36)					
Total fabric heat loss						(33) + (36) =	52.4629	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 40.1654	Feb 39.9228	Mar 39.6851	Apr 38.5686	May 38.3597	Jun 37.3873	Jul 37.3873	Aug 37.2072	Sep 37.7618	Oct 38.3597	Nov 38.7823	Dec 39.2241	(38)
Heat transfer coeff	92.6283	92.3858	92.1480	91.0315	90.8226	89.8502	89.8502	89.6701	90.2247	90.8226	91.2452	91.6870	(39)
Average = Sum(39)m / 12 =												91.0305	(39)
HLP	Jan 1.2616	Feb 1.2583	Mar 1.2551	Apr 1.2399	May 1.2370	Jun 1.2238	Jul 1.2238	Aug 1.2213	Sep 1.2289	Oct 1.2370	Nov 1.2428	Dec 1.2488	(40)
HLP (average)												1.2399	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3262 (42)
Average daily hot water use (litres/day)												89.4475 (43)
Daily hot water use	98.3923	94.8144	91.2365	87.6586	84.0807	80.5028	80.5028	84.0807	87.6586	91.2365	94.8144	98.3923 (44)
Energy conte	145.9129	127.6164	131.6887	114.8094	110.1623	95.0617	88.0886	101.0830	102.2903	119.2094	130.1264	141.3089 (45)
Energy content (annual)										Total = Sum(45)m =		1407.3579 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.8869	19.1425	19.7533	17.2214	16.5243	14.2593	13.2133	15.1625	15.3435	17.8814	19.5190	21.1963 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (58)
Total heat required for water heating calculated for each month	192.5078	169.7021	178.2836	159.9012	156.7572	140.1535	134.6835	147.6779	147.3821	165.8043	175.2183	187.9038 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) =	Sum (63)m =		0.0000	0.0000 (63)
Output from w/h	192.5078	169.7021	178.2836	159.9012	156.7572	140.1535	134.6835	147.6779	147.3821	165.8043	175.2183	187.9038 (64)
								Total per year (kWh/year) =	Sum (64)m =		1955.9753	1955.9753 (64)
Heat gains from water heating, kWh/month	85.7920	76.1010	81.0624	74.2476	73.9049	67.6815	66.5654	70.8860	70.0850	76.9131	79.3405	84.2611 (65)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Not applicable

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3077.6898 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	592.8107	445.8871	357.8252	193.9761	79.5613	0.0000	0.0000	0.0000	0.0000	190.3915	407.1038	610.0841	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	634.0221	476.8846	382.7008	207.4611	85.0923	0.0000	0.0000	0.0000	0.0000	203.6273	435.4052	652.4963	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	192.5078	169.7021	178.2836	159.9012	156.7572	140.1535	134.6835	147.6779	147.3821	165.8043	175.2183	187.9038	(64)
Efficiency of water heater (217)m	87.6200	87.2740	86.6368	85.3301	83.1081	79.8000	79.8000	79.8000	79.8000	85.1833	86.9903	87.7301	(216)
Fuel for water heating, kWh/month	219.7075	194.4474	205.7826	187.3913	188.6184	175.6310	168.7764	185.0600	184.6893	194.6442	201.4227	214.1840	(219)
Water heating fuel used												2320.3549	(219)
Annual totals kWh/year													
Space heating fuel - main system												3077.6898	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												327.9494	(232)
Total delivered energy for all uses												5800.9941	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3077.6898	0.2160	664.7810 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2320.3549	0.2160	501.1967 (264)
Space and water heating			1165.9776 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	327.9494	0.5190	170.2057 (268)
Total CO2, kg/m2/year			1375.1084 (272)
Emissions per m2 for space and water heating			15.8809 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3182 (272b)
Emissions per m2 for pumps and fans			0.5302 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.8809 * 1.55) + 2.3182 + 0.5302, rounded to 2 d.p.			27.4600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010545				Issued on Date	29/04/2022
Assessment Reference	111	Prop Type Ref				
Property						
SAP Rating	82 B	DER	15.97	TER	29.28	
Environmental	89 B	% DER<TER	45.47			
CO ₂ Emissions (t/year)	0.90	DFEE	50.82	TFEE	59.45	
General Requirements Compliance	Pass	% DFEE<TFEE	14.51			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 29.28 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.97 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 59.4 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 50.8 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room stats OK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.61	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing West:	5.88 m ² , No overhang
Windows facing North West:	7.07 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Exposed floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	454.01 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							2	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1275 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			12.9500	1.1450	14.8282		(27)					
Exposed Floor			72.7700	0.1000	7.2770		(28b)					
External Wall	35.0800	12.9500	22.1300	0.1500	3.3195		(29a)					
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)					
Core	18.2300		18.2300	0.2500	4.5575		(29a)					
Total net area of external elements Aum(A, m2)			143.5800				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		35.7747		(33)					
Party Wall 1			18.3000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								16.4236 (36)				
Total fabric heat loss						(33) + (36) =	52.1983 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 17.0688	Feb 16.8774	Mar 16.6860	Apr 15.7292	May 15.5379	Jun 14.5811	Jul 14.5811	Aug 14.3897	Sep 14.9638	Oct 15.5379	Nov 15.9206	Dec 16.3033 (38)
Heat transfer coeff	69.2671	69.0758	68.8844	67.9276	67.7362	66.7794	66.7794	66.5880	67.1621	67.7362	68.1189	68.5017 (39)
Average = Sum(39)m / 12 =												67.8797 (39)
HLP	Jan 0.9519	Feb 0.9492	Mar 0.9466	Apr 0.9335	May 0.9308	Jun 0.9177	Jul 0.9177	Aug 0.9150	Sep 0.9229	Oct 0.9308	Nov 0.9361	Dec 0.9413 (40)
HLP (average)												0.9328 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	Jan 98.0067	Feb 94.4428	Mar 90.8789	Apr 87.3151	May 83.7512	Jun 80.1873	Jul 80.1873	Aug 83.7512	Sep 87.3151	Oct 90.8789	Nov 94.4428	Dec 98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)												Total = Sum(45)m = 1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												

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	21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)
Water storage loss:												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(64)
Heat gains from water heating, kWh/month												
92.5474	82.2081	87.8363	80.8195	80.7069	74.2791	73.3961	77.6998	76.6732	83.7032	85.8924	91.0225	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
18.2553	16.2142	13.1863	9.9829	7.4623	6.3000	6.8074	8.8485	11.8764	15.0798	17.6004	18.7627	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	(71)
Water heating gains (Table 5)												
124.3916	122.3335	118.0596	112.2492	108.4770	103.1654	98.6507	104.4353	106.4905	112.5044	119.2950	122.3421	(72)
Total internal gains												
403.9925	402.0068	389.3790	369.0270	348.4216	328.4959	315.5019	321.2141	331.6232	352.1788	375.8026	393.4637	(73)

6. Solar gains

[Jan]			Area	Solar flux	g		FF	Access		Gains		
			m2	Table 6a	Specific data		Specific data	factor		W		
				W/m2	or Table 6b		or Table 6c	Table 6d				
West			5.8800	19.6403	0.4000		0.8000	0.7700		25.6099 (80)		
Northwest			7.0700	11.2829	0.4000		0.8000	0.7700		17.6899 (81)		
Solar gains	43.2998	86.1067	147.3804	226.8726	290.6833	303.6424	286.5514	237.3201	175.0084	103.4509	54.1910	35.5068 (83)
Total gains	447.2923	488.1134	536.7594	595.8996	639.1049	632.1383	602.0533	558.5342	506.6316	455.6297	429.9935	428.9705 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	72.9563	73.1584	73.3616	74.3950	74.6052	75.6741	75.6741	75.8916	75.2429	74.6052	74.1860	73.7715
alpha	5.8638	5.8772	5.8908	5.9597	5.9737	6.0449	6.0449	6.0594	6.0162	5.9737	5.9457	5.9181
util living area	0.9977	0.9955	0.9879	0.9547	0.8503	0.6542	0.4848	0.5418	0.8166	0.9725	0.9950	0.9982 (86)
MIT	20.0487	20.1612	20.3720	20.6601	20.8837	20.9813	20.9973	20.9950	20.9331	20.6487	20.3030	20.0305 (87)
Th 2	20.1236	20.1259	20.1281	20.1392	20.1414	20.1525	20.1525	20.1547	20.1480	20.1414	20.1369	20.1325 (88)
util rest of house	0.9969	0.9941	0.9837	0.9390	0.8049	0.5767	0.3932	0.4457	0.7484	0.9599	0.9930	0.9976 (89)
MIT 2	18.8487	19.0144	19.3218	19.7379	20.0284	20.1402	20.1515	20.1526	20.0947	19.7301	19.2301	18.8288 (90)
Living area fraction									fLA = Living area / (4) =			0.3848 (91)
MIT	19.3104	19.4556	19.7259	20.0927	20.3575	20.4638	20.4769	20.4768	20.4173	20.0835	19.6429	19.2912 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3104	19.4556	19.7259	20.0927	20.3575	20.4638	20.4769	20.4768	20.4173	20.0835	19.6429	19.2912 (93)

8. Space heating requirement

Utilisation	0.9959	0.9926	0.9813	0.9380	0.8173	0.6060	0.4285	0.4829	0.7717	0.9589	0.9916	0.9968 (94)
Useful gains	445.4743	484.4954	526.7263	558.9567	522.3341	383.0500	257.9990	269.6909	390.9618	436.9042	426.3607	427.5904 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
1039.7279	1005.4410	911.0591	760.2949	586.4273	391.5827	258.8998	271.4637	424.2822	642.3778	854.4101	1033.7730	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
442.1247	350.0755	285.9436	144.9635	47.6853	0.0000	0.0000	0.0000	0.0000	152.8723	308.1955	450.9998	(98)
Space heating												2182.8603 (98)
Space heating per m2												(98) / (4) = 29.9967 (99)

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8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	2182.8603 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	2446.9864 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	128.7888 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2052.6825 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2301.0570 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	121.1083 (310b)
Electricity used for heat distribution	49.9794 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	169.2357 (330a)
Total electricity for the above, kWh/year	169.2357 (331)
Electricity for lighting (calculated in Appendix L)	322.3944 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	5489.5706 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1899.2174	0.5190	985.6938 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	252.4212	0.5190	131.0066 (368)
Electrical energy for heat distribution	49.9794	0.5190	25.9393 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1142.6397 (373)
Space and water heating			1142.6397 (376)
Pumps and fans	169.2357	0.5190	87.8333 (378)
Energy for lighting	322.3944	0.5190	167.3227 (379)
Energy saving/generation technologies			
PV Unit	-454.0100	0.5190	-235.6312 (380)
Total CO2, kg/year			1162.1646 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.9700 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			15.9700 ZC1
Total Floor Area		TFA	72.7700
Assumed number of occupants		N	2.3115
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.5855 ZC2
CO2 emissions from cooking, equation (L16)			2.3976 ZC3
Total CO2 emissions			34.9531 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			34.9531 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1649 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4149 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3527 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4497	0.4408	0.4320	0.3879	0.3791	0.3350	0.3350	0.3262	0.3527	0.3791	0.3968	0.4144 (22b)
Effective ac	0.6011	0.5972	0.5933	0.5752	0.5719	0.5561	0.5561	0.5532	0.5622	0.5719	0.5787	0.5859 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			12.9500	1.3258	17.1686			(27)					
Exposed Floor			72.7700	0.1300	9.4601			(28b)					
External Wall	35.0800	12.9500	22.1300	0.1800	3.9834			(29a)					
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098			(29a)					
Core	18.2300		18.2300	0.1800	3.2814			(29a)					
Total net area of external elements Aum(A, m2)			143.5800					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.5933			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								15.1820 (36)					
Total fabric heat loss						(33) + (36) =		53.7753 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 36.0868	Feb 35.8511	Mar 35.6201	Apr 34.5351	May 34.3321	Jun 33.3870	Jul 33.3870	Aug 33.2120	Sep 33.7511	Oct 34.3321	Nov 34.7427	Dec 35.1721	(38)
Heat transfer coeff	89.8620	89.6264	89.3954	88.3103	88.1073	87.1623	87.1623	86.9873	87.5263	88.1073	88.5180	88.9473	(39)
Average = Sum(39)m / 12 =												88.3094	(39)
HLP	Jan 1.2349	Feb 1.2316	Mar 1.2285	Apr 1.2136	May 1.2108	Jun 1.1978	Jul 1.1978	Aug 1.1954	Sep 1.2028	Oct 1.2108	Nov 1.2164	Dec 1.2223	(40)
HLP (average)												1.2135	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)										Total = Sum(45)m =		1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												
21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)	
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

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Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (64)
Heat gains from water heating, kWh/month	85.6018	75.9347	80.8908	74.0980	73.7613	67.5576	66.4506	70.7543	69.9517	76.7577	79.1709	84.0770 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5798	16.5024	13.4206	10.1603	7.5949	6.4120	6.9283	9.0057	12.0875	15.3478	17.9132	19.0961	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	(71)
Water heating gains (Table 5)	115.0562	112.9981	108.7242	102.9139	99.1416	93.8300	89.3153	95.0999	97.1551	103.1690	109.9597	113.0067	(72)
Total internal gains	397.9816	395.9596	383.2780	362.8690	342.2188	322.2725	309.2875	315.0360	325.4989	346.1114	369.7800	387.4618	(73)

6. Solar gains

[Jan]				Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W	
West				5.8800	19.6403	0.6300	0.7000	0.7700			35.2936 (80)	
Northwest				7.0700	11.2829	0.6300	0.7000	0.7700			24.3789 (81)	
Solar gains	59.6725	118.6657	203.1086	312.6588	400.5979	418.4572	394.9036	327.0568	241.1834	142.5683	74.6819	48.9328 (83)
Total gains	457.6541	514.6253	586.3866	675.5278	742.8167	740.7297	704.1911	642.0927	566.6823	488.6797	444.4619	436.3946 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	56.2359	56.3838	56.5295	57.2240	57.3559	57.9777	57.9777	58.0944	57.7366	57.3559	57.0898	56.8142
alpha	4.7491	4.7589	4.7686	4.8149	4.8237	4.8652	4.8652	4.8730	4.8491	4.8237	4.8060	4.7876
util living area	0.9975	0.9952	0.9874	0.9565	0.8662	0.6954	0.5313	0.5982	0.8543	0.9769	0.9952	0.9980 (86)
MIT	19.6729	19.8163	20.0874	20.4611	20.7754	20.9453	20.9880	20.9795	20.8468	20.4397	19.9951	19.6513 (87)
Th 2	19.8922	19.8948	19.8973	19.9092	19.9114	19.9218	19.9218	19.9237	19.9178	19.9114	19.9069	19.9022 (88)
util rest of house	0.9967	0.9936	0.9828	0.9399	0.8172	0.6006	0.4079	0.4705	0.7819	0.9651	0.9932	0.9974 (89)
MIT 2	18.1331	18.3440	18.7393	19.2789	19.6937	19.8862	19.9175	19.9154	19.7940	19.2593	18.6141	18.1085 (90)
Living area fraction	18.7256	18.9105	19.2580	19.7338	20.1099	20.2937	20.3294	20.3248	20.1991	fLA = Living area / (4) =		0.3848 (91)
MIT	18.7256	18.9105	19.2580	19.7338	20.1099	20.2937	20.3294	20.3248	20.1991	19.7135	19.1455	18.7021 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7256	18.9105	19.2580	19.7338	20.1099	20.2937	20.3294	20.3248	20.1991	19.7135	19.1455	18.7021 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	455.5401	510.2457	574.1847	632.7059	614.5011	470.4759	320.9503	333.8631	455.2550	470.2260	440.5719	434.7806	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1296.3112	1255.7099	1140.5072	956.7349	740.9735	496.2745	325.0657	341.4106	533.8312	802.9668	1066.2411	1289.9263	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	625.5337	500.9519	421.3439	233.3009	94.0954	0.0000	0.0000	0.0000	0.0000	247.5592	450.4818	636.2283	(98)
Space heating												3209.4952	(98)
Space heating per m ²												44.1046	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3432.6152 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	625.5337	500.9519	421.3439	233.3009	94.0954	0.0000	0.0000	0.0000	0.0000	247.5592	450.4818	636.2283	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	669.0200	535.7774	450.6352	249.5196	100.6368	0.0000	0.0000	0.0000	0.0000	264.7692	481.7987	680.4581	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500	(64)
Efficiency of water heater (217)m	87.7378	87.5365	87.0372	85.8278	83.5100	79.8000	79.8000	79.8000	79.8000	85.8885	87.2314	87.8213	(216)
Fuel for water heating, kWh/month	218.7609	193.2930	204.2432	185.7804	187.1938	175.1642	168.3438	184.5636	184.1870	192.5022	200.2813	213.3310	(219)
Water heating fuel used												2307.6443	(219)
Annual totals kWh/year													
Space heating fuel - main system												3432.6152	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												328.1242	(232)
Total delivered energy for all uses												6143.3838	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3432.6152	0.2160	741.4449 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2307.6443	0.2160	498.4512 (264)
Space and water heating			1239.8961 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	328.1242	0.5190	170.2965 (268)
Total CO2, kg/m2/year			1449.1175 (272)
Emissions per m2 for space and water heating			17.0386 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3402 (272b)
Emissions per m2 for pumps and fans			0.5349 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.0386 * 1.55) + 2.3402 + 0.5349, rounded to 2 d.p.			29.2800 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010546				Issued on Date	29/04/2022
Assessment Reference	112	Prop Type Ref				
Property						
SAP Rating	82 B	DER	16.38	TER	30.02	
Environmental	88 B	% DER<TER	45.43			
CO ₂ Emissions (t/year)	0.93	DFEE	52.36	TFEE	61.67	
General Requirements Compliance	Pass	% DFEE<TFEE	15.09			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aecom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 30.02 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.38 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 61.7 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 52.4 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room stats OK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.61	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing North:	5.88 m ² , No overhang
Windows facing North West:	7.07 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Exposed floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	454.01 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							2	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1275 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			12.9500	1.1450	14.8282		(27)					
Exposed Floor			72.7700	0.1000	7.2770		(28b)					
External Wall	35.0800	12.9500	22.1300	0.1500	3.3195		(29a)					
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)					
Core	18.2300		18.2300	0.2500	4.5575		(29a)					
Total net area of external elements Aum(A, m2)			143.5800				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		35.7747		(33)					
Party Wall 1			18.3000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								16.4236 (36)				
Total fabric heat loss						(33) + (36) =	52.1983 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 17.0688	Feb 16.8774	Mar 16.6860	Apr 15.7292	May 15.5379	Jun 14.5811	Jul 14.5811	Aug 14.3897	Sep 14.9638	Oct 15.5379	Nov 15.9206	Dec 16.3033 (38)
Heat transfer coeff	69.2671	69.0758	68.8844	67.9276	67.7362	66.7794	66.7794	66.5880	67.1621	67.7362	68.1189	68.5017 (39)
Average = Sum(39)m / 12 =												67.8797 (39)
HLP	Jan 0.9519	Feb 0.9492	Mar 0.9466	Apr 0.9335	May 0.9308	Jun 0.9177	Jul 0.9177	Aug 0.9150	Sep 0.9229	Oct 0.9308	Nov 0.9361	Dec 0.9413 (40)
HLP (average)												0.9328 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	Jan 98.0067	Feb 94.4428	Mar 90.8789	Apr 87.3151	May 83.7512	Jun 80.1873	Jul 80.1873	Aug 83.7512	Sep 87.3151	Oct 90.8789	Nov 94.4428	Dec 98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)												Total = Sum(45)m = 1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												

	21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)
Water storage loss:												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage												
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
	200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) =	Sum(63)m =			0.0000 (63)
Output from w/h												
	200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319 (64)
								Total per year (kWh/year) =	Sum(64)m =			2052.6825 (64)
Heat gains from water heating, kWh/month												
	92.5474	82.2081	87.8363	80.8195	80.7069	74.2791	73.3961	77.6998	76.6732	83.7032	85.8924	91.0225 (65)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9964	0.9941	0.9864	0.9548	0.8530	0.6475	0.4633	0.5243	0.8140	0.9681	0.9928	0.9971 (94)
Useful gains	433.9934	461.7903	492.5012	523.1235	502.4792	379.1243	257.4647	268.5978	378.3411	414.0994	412.1952	418.2621 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1038.3392	1002.7049	906.9277	756.0255	584.1804	391.1664	258.8352	271.3408	422.8984	639.6613	852.7179	1032.6538 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	449.6333	363.4946	308.3333	167.6895	60.7856	0.0000	0.0000	0.0000	0.0000	167.8180	317.1764	457.1074 (98)
Space heating												2292.0382 (98)
Space heating per m2												31.4970 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump	0.9500	(303a)
Fraction of heat from community Boilers	0.0500	(303b)
Fraction of total space heat from community Heat pump	0.9500	(304a)
Fraction of total space heat from community Boilers	0.0500	(304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.1800	(306)
Space heating:		
Annual space heating requirement	2292.0382	(98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	2569.3748	(307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	135.2303	(307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	2052.6825	(64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2301.0570	(310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	121.1083	(310b)
Electricity used for heat distribution	51.2677	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)		
mechanical ventilation fans (SFP = 0.7625)	169.2357	(330a)
Total electricity for the above, kWh/year	169.2357	(331)
Electricity for lighting (calculated in Appendix L)	322.3944	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
Total delivered energy for all uses	5618.4004	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			250.0000	(367a)
Space heating from Heat pump	1948.1727	0.5190	1011.1016	(367)
Efficiency of heat source Boilers			99.0000	(367b)
Space heating from Boilers	258.9278	0.5190	134.3835	(368)
Electrical energy for heat distribution	51.2677	0.5190	26.6079	(372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1172.0931	(373)
Space and water heating			1172.0931	(376)
Pumps and fans	169.2357	0.5190	87.8333	(378)
Energy for lighting	322.3944	0.5190	167.3227	(379)
Energy saving/generation technologies				
PV Unit	-454.0100	0.5190	-235.6312	(380)
Total CO2, kg/year			1191.6179	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			16.3800	(384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			16.3800	ZC1
Total Floor Area		TFA	72.7700	
Assumed number of occupants		N	2.3115	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.5855	ZC2
CO2 emissions from cooking, equation (L16)			2.3976	ZC3
Total CO2 emissions			35.3631	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			35.3631	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1649 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4149 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3527 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4497	0.4408	0.4320	0.3879	0.3791	0.3350	0.3350	0.3262	0.3527	0.3791	0.3968	0.4144 (22b)
Effective ac	0.6011	0.5972	0.5933	0.5752	0.5719	0.5561	0.5561	0.5532	0.5622	0.5719	0.5787	0.5859 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			1.8900	1.0000	1.8900			(26)					
TER Opening Type (Uw = 1.40)			12.9500	1.3258	17.1686			(27)					
Exposed Floor			72.7700	0.1300	9.4601			(28b)					
External Wall	35.0800	12.9500	22.1300	0.1800	3.9834			(29a)					
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098			(29a)					
Core	18.2300		18.2300	0.1800	3.2814			(29a)					
Total net area of external elements Aum(A, m2)			143.5800					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.5933			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K									250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)									15.1820 (36)				
Total fabric heat loss						(33) + (36) =	53.7753	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	36.0868	35.8511	35.6201	34.5351	34.3321	33.3870	33.3870	33.2120	33.7511	34.3321	34.7427	35.1721	(38)
Heat transfer coeff	89.8620	89.6264	89.3954	88.3103	88.1073	87.1623	87.1623	86.9873	87.5263	88.1073	88.5180	88.9473	(39)
Average = Sum(39)m / 12 =												88.3094	(39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2349	1.2316	1.2285	1.2136	1.2108	1.1978	1.1978	1.1954	1.2028	1.2108	1.2164	1.2223	(40)
HLP (average)												1.2135	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)										Total = Sum(45)m =		1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												
21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)	
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (64)
Heat gains from water heating, kWh/month	85.6018	75.9347	80.8908	74.0980	73.7613	67.5576	66.4506	70.7543	69.9517	76.7577	79.1709	84.0770 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5798	16.5024	13.4206	10.1603	7.5949	6.4120	6.9283	9.0057	12.0875	15.3478	17.9132	19.0961	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	(71)
Water heating gains (Table 5)	115.0562	112.9981	108.7242	102.9139	99.1416	93.8300	89.3153	95.0999	97.1551	103.1690	109.9597	113.0067	(72)
Total internal gains	397.9816	395.9596	383.2780	362.8690	342.2188	322.2725	309.2875	315.0360	325.4989	346.1114	369.7800	387.4618	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
North					5.8800	10.6334	0.6300	0.7000			0.7700	19.1083 (74)
Northwest					7.0700	11.2829	0.6300	0.7000			0.7700	24.3789 (81)
Solar gains	43.4871	86.1407	151.4575	246.5010	331.6343	354.1512	331.0351	263.3898	183.5487	104.1129	54.2474	35.8386 (83)
Total gains	441.4687	482.1003	534.7355	609.3700	673.8531	676.4237	640.3226	578.4258	509.0476	450.2243	424.0274	423.3004 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	56.2359	56.3838	56.5295	57.2240	57.3559	57.9777	57.9777	58.0944	57.7366	57.3559	57.0898	56.8142
alpha	4.7491	4.7589	4.7686	4.8149	4.8237	4.8652	4.8652	4.8730	4.8491	4.8237	4.8060	4.7876
util living area	0.9979	0.9964	0.9913	0.9701	0.8983	0.7411	0.5781	0.6518	0.8915	0.9832	0.9961	0.9983 (86)
MIT	19.6526	19.7758	20.0252	20.3909	20.7267	20.9277	20.9829	20.9704	20.8081	20.3954	19.9696	19.6348 (87)
Th 2	19.8922	19.8948	19.8973	19.9092	19.9114	19.9218	19.9218	19.9237	19.9178	19.9114	19.9069	19.9022 (88)
util rest of house	0.9972	0.9951	0.9881	0.9579	0.8563	0.6471	0.4469	0.5184	0.8292	0.9743	0.9944	0.9977 (89)
MIT 2	18.1034	18.2852	18.6500	19.1831	19.6376	19.8728	19.9155	19.9112	19.7547	19.1977	18.5772	18.0844 (90)
Living area fraction									fLA = Living area / (4) =			0.3846 (91)
MIT	18.6993	18.8585	19.1789	19.6477	20.0565	20.2786	20.3260	20.3186	20.1598	19.6584	19.1128	18.6807 (92)
Temperature adjustment												0.000
adjusted MIT	18.6993	18.8585	19.1789	19.6477	20.0565	20.2786	20.3260	20.3186	20.1598	19.6584	19.1128	18.6807 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	439.7040	478.9183	526.7761	581.4154	581.4024	460.3668	318.7715	329.7272	430.4523	437.3646	420.9400	421.9182	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1293.9509	1251.0536	1133.4361	949.1326	736.2711	494.9563	324.7702	340.8669	530.3960	798.1075	1063.3453	1288.0228	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	635.5597	518.8749	451.3551	264.7564	115.2223	0.0000	0.0000	0.0000	0.0000	268.3927	462.5318	644.3818	(98)
Space heating												3361.0748	(98)
Space heating per m ²												46.1876	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3594.7324 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	635.5597	518.8749	451.3551	264.7564	115.2223	0.0000	0.0000	0.0000	0.0000	268.3927	462.5318	644.3818	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	679.7430	554.9464	482.7327	283.1620	123.2324	0.0000	0.0000	0.0000	0.0000	287.0511	494.6864	689.1784	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500	(64)
Efficiency of water heater (217)m	87.7703	87.6113	87.1963	86.1577	84.0148	79.8000	79.8000	79.8000	79.8000	86.0992	87.2911	87.8468	(216)
Fuel for water heating, kWh/month	218.6800	193.1281	203.8704	185.0692	186.0689	175.1642	168.3438	184.5636	184.1870	192.0310	200.1446	213.2691	(219)
Water heating fuel used												2304.5198	(219)
Annual totals kWh/year													
Space heating fuel - main system												3594.7324	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												328.1242	(232)
Total delivered energy for all uses												6302.3765	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3594.7324	0.2160	776.4622 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2304.5198	0.2160	497.7763 (264)
Space and water heating			1274.2385 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	328.1242	0.5190	170.2965 (268)
Total CO2, kg/m2/year			1483.4600 (272)
Emissions per m2 for space and water heating			17.5105 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3402 (272b)
Emissions per m2 for pumps and fans			0.5349 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.5105 * 1.55) + 2.3402 + 0.5349, rounded to 2 d.p.			30.0200 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010547			Issued on Date	29/04/2022
Assessment Reference	113	Prop Type Ref			
Property					
SAP Rating	84 B	DER	11.80	TER	23.45
Environmental	92 A	% DER<TER	49.69		
CO ₂ Emissions (t/year)	0.69	DFEE	34.89	TFEE	40.93
General Requirements Compliance	Fail	% DFEE<TFEE	14.77		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aecom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 74 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 23.45 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 11.80 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 40.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 34.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading: Average
Windows facing North: 1.97 m², No overhang
Windows facing North East: 6.47 m², No overhang
Windows facing East: 2.21 m², No overhang
Windows facing South East: 6.24 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Exposed floor U-value 0.10 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 454.01 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												75.6500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			16.8900	1.1450	19.3397		(27)
Exposed Floor			3.1300	0.1000	0.3130		(28b)
External Wall	49.6500	16.8900	32.7600	0.1500	4.9140		(29a)
Corridor	4.5800	1.8900	2.6900	0.2500	0.6725		(29a)
Total net area of external elements Aum(A, m2)			57.3600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		27.1292		(33)
Party Wall 1			38.0500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.5544 (36)
Total fabric heat loss						(33) + (36) =	36.6836 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	17.2447	17.0514	16.8580	15.8913	15.6980	14.7313	14.7313	14.5380	15.1180	15.6980	16.0847	16.4714 (38)
Average = Sum(39)m / 12 =	53.9283	53.7350	53.5416	52.5749	52.3816	51.4149	51.4149	51.2216	51.8016	52.3816	52.7683	53.1549 (39)
												52.5266 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7335	0.7309	0.7283	0.7151	0.7125	0.6993	0.6993	0.6967	0.7046	0.7125	0.7177	0.7230 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3285 (42)
Average daily hot water use (litres/day)													89.5010 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)	
Energy conte	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)	
Energy content (annual)												Total = Sum(45)m = 1408.1991 (45)	
Distribution loss (46)m = 0.15 x (45)m	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)	

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	201.2769	177.6201	187.0442	168.3717	165.5050	148.6122	143.4181	156.4202	155.8451	174.5575	183.6979	196.6701	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
	Solar input (sum of months) = Sum (63)m =											0.0000 (63)	
Output from w/h													
	201.2769	177.6201	187.0442	168.3717	165.5050	148.6122	143.4181	156.4202	155.8451	174.5575	183.6979	196.6701	(64)
	Total per year (kWh/year) = Sum (64)m =											2059.0388 (64)	
Heat gains from water heating, kWh/month													
	92.7665	82.3997	88.0341	80.9919	80.8723	74.4219	73.5284	77.8516	76.8268	83.8823	86.0878	91.2347	(65)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1078.1968 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1208.6586 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	63.6136 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2059.0388 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2308.1825 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	121.4833 (310b)
Electricity used for heat distribution	37.0194 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	170.9800 (330a)
Total electricity for the above, kWh/year	170.9800 (331)
Electricity for lighting (calculated in Appendix L)	323.3395 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	4196.2575 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1406.7364	0.5190	730.0962 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	186.9666	0.5190	97.0356 (368)
Electrical energy for heat distribution	37.0194	0.5190	19.2131 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			846.3449 (373)
Space and water heating			846.3449 (376)
Pumps and fans	170.9800	0.5190	88.7386 (378)
Energy for lighting	323.3395	0.5190	167.8132 (379)
Energy saving/generation technologies			
PV Unit	-454.0100	0.5190	-235.6312 (380)
Total CO2, kg/year			867.2655 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			11.8000 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		11.8000 ZC1
Total Floor Area	TFA	73.5200
Assumed number of occupants	N	2.3285
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.5530 ZC2
CO2 emissions from cooking, equation (L16)		2.3787 ZC3
Total CO2 emissions		30.7317 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		30.7317 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					30.0000 / (5) = 0.1632 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4132 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3512 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4478	0.4390	0.4303	0.3864	0.3776	0.3337	0.3337	0.3249	0.3512	0.3776	0.3951	0.4127 (22b)
	0.6003	0.5964	0.5926	0.5746	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			16.4900	1.3258	21.8617		(27)
Exposed Floor			3.1300	0.1300	0.4069		(28b)
External Wall	49.6500	16.4900	33.1600	0.1800	5.9688		(29a)
Corridor	4.5800	1.8900	2.6900	0.1800	0.4842		(29a)
Total net area of external elements Aum(A, m ²)			57.3600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.6116		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.5686 (36)
Total fabric heat loss						(33) + (36) =	38.1802 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.4091	36.1729	35.9414	34.8541	34.6506	33.7036	33.7036	33.5282	34.0684	34.6506	35.0622	35.4924 (38)
Heat transfer coeff	74.5893	74.3531	74.1217	73.0343	72.8309	71.8838	71.8838	71.7085	72.2486	72.8309	73.2424	73.6727 (39)
Average = Sum(39)m / 12 =												73.0333 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0145	1.0113	1.0082	0.9934	0.9906	0.9777	0.9777	0.9754	0.9827	0.9906	0.9962	1.0021 (40)
HLP (average)												0.9934 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy content (annual)	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1408.1991 (45)
Water storage loss:	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
Heat gains from water heating, kWh/month	85.8210	76.1264	81.0886	74.2704	73.9268	67.7004	66.5829	70.9061	70.1053	76.9367	79.3664	84.2892 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3070	16.2601	13.2236	10.0111	7.4834	6.3178	6.8266	8.8735	11.9100	15.1225	17.6502	18.8158 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385 (71)
Water heating gains (Table 5)	115.3508	113.2833	108.9900	103.1533	99.3640	94.0283	89.4931	95.3039	97.3685	103.4096	110.2311	113.2919 (72)
Total internal gains	399.9539	397.9707	385.2706	364.7888	344.0400	323.9750	310.8872	316.6137	327.0851	347.7714	371.5522	389.3425 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				1.9200	10.6334	0.6300	0.7000	0.7700	6.2394 (74)			
Northeast				6.3200	11.2829	0.6300	0.7000	0.7700	21.7927 (75)			
East				2.1600	19.6403	0.6300	0.7000	0.7700	12.9650 (76)			
Southeast				6.0900	36.7938	0.6300	0.7000	0.7700	68.4801 (77)			

Solar gains	109.4772	198.2928	301.5531	422.4704	516.4299	531.3511	504.5419	431.8290	343.1398	227.4190	133.3072	92.2650 (83)
Total gains	509.4312	596.2635	686.8237	787.2591	860.4699	855.3261	815.4291	748.4428	670.2249	575.1904	504.8594	481.6075 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	68.4489	68.6663	68.8808	69.9063	70.1015	71.0251	71.0251	71.1988	70.6665	70.1015	69.7076	69.3005
alpha	5.5633	5.5778	5.5921	5.6604	5.6734	5.7350	5.7350	5.7466	5.7111	5.6734	5.6472	5.6200
util living area	0.9959	0.9896	0.9689	0.8943	0.7331	0.5307	0.3868	0.4385	0.7031	0.9400	0.9903	0.9970 (86)
MIT	20.0330	20.2045	20.4633	20.7638	20.9388	20.9919	20.9989	20.9978	20.9640	20.7148	20.3191	20.0055 (87)
Th 2	20.0712	20.0739	20.0765	20.0888	20.0912	20.1019	20.1019	20.1039	20.0978	20.0912	20.0865	20.0816 (88)
util rest of house	0.9946	0.9863	0.9592	0.8652	0.6773	0.4594	0.3085	0.3543	0.6265	0.9163	0.9867	0.9960 (89)
MIT 2	18.7866	19.0372	19.4091	19.8269	20.0366	20.0970	20.1015	20.1031	20.0719	19.7747	19.2145	18.7542 (90)
Living area fraction									fLA = Living area / (4) =			0.3678 (91)
MIT	19.2450	19.4665	19.7968	20.1715	20.3684	20.4261	20.4316	20.4321	20.4000	20.1205	19.6207	19.2144 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2450	19.4665	19.7968	20.1715	20.3684	20.4261	20.4316	20.4321	20.4000	20.1205	19.6207	19.2144 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9930	0.9836	0.9557	0.8682	0.6951	0.4854	0.3373	0.3853	0.6533	0.9172	0.9843	0.9947 (94)
Useful gains	505.8630	586.4699	656.3785	683.4644	598.1050	415.2146	275.0661	288.3863	437.8537	527.5395	496.9107	479.0565 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1114.7375	1083.0663	985.5816	823.2046	631.3302	418.8029	275.4274	289.1381	455.1672	693.3834	917.0489	1106.1510 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	453.0026	333.7127	244.9271	100.6129	24.7196	0.0000	0.0000	0.0000	0.0000	123.3879	302.4995	466.5582 (98)
Space heating												2049.4206 (98)
Space heating per m2										(98) / (4) =		27.8757 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												2191.8937 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	453.0026	333.7127	244.9271	100.6129	24.7196	0.0000	0.0000	0.0000	0.0000	123.3879	302.4995	466.5582 (98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000 (210)
Space heating fuel (main heating system)	484.4948	356.9120	261.9541	107.6074	26.4381	0.0000	0.0000	0.0000	0.0000	131.9656	323.5289	498.9928 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
Efficiency of water heater (217)m	87.0192	86.5852	85.6602	83.6171	81.1057	79.8000	79.8000	79.8000	79.8000	84.0383	86.2567	79.8000 (216)
Fuel for water heating, kWh/month	221.3247	196.0825	208.2207	191.3122	193.3564	175.7022	168.8423	185.1357	184.7660	197.3809	203.2260	215.7211 (219)
Water heating fuel used												2341.0708 (219)
Annual totals kWh/year												
Space heating fuel - main system												2191.8937 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												323.3067 (232)
Total delivered energy for all uses												4931.2712 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2191.8937	0.2160	473.4490 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2341.0708	0.2160	505.6713 (264)
Space and water heating			979.1203 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	323.3067	0.5190	167.7962 (268)
Total CO2, kg/m2/year			1185.8415 (272)
Emissions per m2 for space and water heating			13.3177 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.2823 (272b)
Emissions per m2 for pumps and fans			0.5294 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.3177 * 1.55) + 2.2823 + 0.5294, rounded to 2 d.p.			23.4500 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010548			Issued on Date	29/04/2022
Assessment Reference	114	Prop Type Ref			
Property					
SAP Rating	84 B	DER	10.88	TER	23.69
Environmental	93 A	% DER<TER	54.08		
CO ₂ Emissions (t/year)	0.47	DFEE	28.59	TFEE	30.75
General Requirements Compliance	Fail	% DFEE<TFEE	7.05		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 23.69 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 10.88 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)30.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)28.6 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing South East:	6.24 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	454.01 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							3	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.7750 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1163 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)					
External Wall	19.8500	8.4500	11.4000	0.1500	1.7100		(29a)					
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)					
Total net area of external elements Aum(A, m2)				37.3500			(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	17.1781		(33)					
Party Wall 1				37.0000	0.0000	0.0000	(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.3010 (36)					
Total fabric heat loss							(33) + (36) = 22.4791 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 11.1341	Feb 11.0123	Mar 10.8905	Apr 10.2816	May 10.1599	Jun 9.5510	Jul 9.5510	Aug 9.4292	Sep 9.7945	Oct 10.1599	Nov 10.4034	Dec 10.6470 (38)
Heat transfer coeff	33.6132	33.4914	33.3696	32.7607	32.6389	32.0301	32.0301	31.9083	32.2736	32.6389	32.8825	33.1260 (39)
Average = Sum(39)m / 12 =	32.7303 (39)											
HLP	Jan 0.6618	Feb 0.6594	Mar 0.6570	Apr 0.6450	May 0.6426	Jun 0.6306	Jul 0.6306	Aug 0.6282	Sep 0.6354	Oct 0.6426	Nov 0.6474	Dec 0.6522 (40)
HLP (average)	0.6444 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan 82.3820	Feb 79.3863	Mar 76.3906	Apr 73.3949	May 70.3992	Jun 67.4035	Jul 67.4035	Aug 70.3992	Sep 73.3949	Oct 76.3906	Nov 79.3863	Dec 82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (56)													
If cylinder contains dedicated solar storage													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (57)													
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month													
177.4469 156.7782 165.5372 149.6214 147.5136 133.0871 129.0318 139.9117 139.1394 155.0886 162.4461 173.5921 (62)													
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
177.4469 156.7782 165.5372 149.6214 147.5136 133.0871 129.0318 139.9117 139.1394 155.0886 162.4461 173.5921 (64)													
Total per year (kWh/year) = Sum(64)m =													1829.1942 (64)
Heat gains from water heating, kWh/month													
84.8430 75.4698 80.8830 74.7574 74.8902 69.2597 68.7450 72.3625 71.2721 77.4089 79.0216 83.5613 (65)													

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
13.4839 11.9763 9.7398 7.3736 5.5119 4.6534 5.0281 6.5357 8.7723 11.1384 13.0002 13.8587 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
149.2855 150.8347 146.9309 138.6204 128.1298 118.2701 111.6832 110.1341 114.0378 122.3484 132.8390 142.6987 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 (69)													
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													
-68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 (71)													
Water heating gains (Table 5)													
114.0363 112.3063 108.7138 103.8297 100.6589 96.1941 92.3992 97.2615 98.9891 104.0442 109.7522 112.3135 (72)													
Total internal gains	325.5065	323.8179	314.0852	298.5244	283.0012	267.8182	257.8112	262.6320	270.4999	286.2317	304.2921	317.5716	317.5716 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W	
Southeast					6.2400	36.7938	0.4000	0.8000			0.7700	50.9147 (77)	
South					2.2100	46.7521	0.4000	0.8000			0.7700	22.9127 (78)	
Solar gains	73.8274	124.2516	166.4633	201.0539	220.9821	217.6723	210.5612	195.8614	178.4200	136.3256	88.1434	63.3710 (83)	
Total gains	399.3338	448.0695	480.5485	499.5783	503.9832	485.4906	468.3724	458.4934	448.9198	422.5573	392.4355	380.9426 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
tau	104.9316	105.3132	105.6975	107.6620	108.0637	110.1179	110.1179	110.5382	109.2869	108.0637	107.2633	106.4746	106.4746 (86)
alpha	7.9954	8.0209	8.0465	8.1775	8.2042	8.3412	8.3412	8.3692	8.2858	8.2042	8.1509	8.0983	8.0983 (87)
util living area	0.9801	0.9528	0.8925	0.7654	0.5985	0.4221	0.3009	0.3201	0.4953	0.7731	0.9457	0.9849	0.9849 (88)
MIT	20.6551	20.7720	20.8883	20.9714	20.9961	20.9998	21.0000	21.0000	20.9993	20.9740	20.8251	20.6313	20.6313 (89)
Th 2	20.3747	20.3768	20.3790	20.3896	20.3918	20.4025	20.4025	20.4047	20.3982	20.3918	20.3875	20.3832	20.3832 (90)
util rest of house	0.9751	0.9424	0.8724	0.7336	0.5607	0.3827	0.2600	0.2787	0.4524	0.7361	0.9322	0.9810	0.9810 (91)
MIT 2	19.9260	20.0911	20.2483	20.3601	20.3885	20.4024	20.4025	20.4046	20.3977	20.3663	20.1755	19.8996	19.8996 (92)
Living area fraction													
fLA = Living area / (4) =													
MIT	20.2926	20.4335	20.5701	20.6675	20.6940	20.7028	20.7030	20.7040	20.7002	20.6719	20.5022	20.2675	20.2675 (93)
Temperature adjustment													
adjusted MIT	20.2926	20.4335	20.5701	20.6675	20.6940	20.7028	20.7030	20.7040	20.7002	20.6719	20.5022	20.2675	20.2675 (94)

8. Space heating requirement

Utilisation	0.9744	0.9434	0.8789	0.7484	0.5796	0.4025	0.2806	0.2995	0.4740	0.7535	0.9349	0.9801	0.9801 (94)
Useful gains	389.0916	422.7160	422.3306	373.8624	292.0911	195.4142	131.4154	137.3297	212.7811	318.4072	366.9047	373.3658	373.3658 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	4.2000 (96)
Heat loss rate W	537.5630	520.2378	469.5140	385.5124	293.5554	195.4733	131.4178	137.3337	213.0138	328.7359	440.6970	532.2525	532.2525 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	110.4627	65.5347	35.1045	8.3880	1.0895	0.0000	0.0000	0.0000	0.0000	7.6845	53.1304	118.2117	118.2117 (98)
Space heating													
Space heating per m2													
(98) / (4) =													7.8678 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	399.6060 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	447.9583 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	23.5768 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2050.5266 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	107.9225 (310b)
Electricity used for heat distribution	26.2998 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	238.1302 (332)
Energy saving/generation technologies (Appendices M, N and Q)	
Total delivered energy for all uses	2990.1056 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	999.3940	0.5190	518.6855 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	132.8275	0.5190	68.9375 (368)
Electrical energy for heat distribution	26.2998	0.5190	13.6496 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			601.2726 (373)
Space and water heating			601.2726 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	238.1302	0.5190	123.5896 (379)
Energy saving/generation technologies			
PV Unit	-454.0100	0.5190	-235.6312 (380)
Total CO2, kg/year			552.5444 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			10.8800 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		10.8800 ZC1
Total Floor Area	TFA	50.7900
Assumed number of occupants	N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.4175 ZC2
CO2 emissions from cooking, equation (L16)		3.1526 ZC3
Total CO2 emissions		31.4501 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		31.4501 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 20.0000 / (5) = 0.1575 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4075 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
Effective ac	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)					
External Wall	19.8500	8.4500	11.4000	0.1800	2.0520		(29a)					
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)					
Total net area of external elements Aum(A, m2)			37.3500				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	17.9545		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.9726 (36)					
Total fabric heat loss						(33) + (36) =	21.9271 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 24.3480	Feb 24.2160	Mar 24.0867	Apr 23.4794	May 23.3658	Jun 22.8368	Jul 22.8368	Aug 22.7389	Sep 23.0406	Oct 23.3658	Nov 23.5957	Dec 23.8360 (38)
Heat transfer coeff	46.2750	46.1431	46.0138	45.4065	45.2928	44.7639	44.7639	44.6659	44.9676	45.2928	45.5227	45.7630 (39)
Average = Sum(39)m / 12 =												45.4059 (39)
HLP	Jan 0.9111	Feb 0.9085	Mar 0.9060	Apr 0.8940	May 0.8918	Jun 0.8814	Jul 0.8814	Aug 0.8794	Sep 0.8854	Oct 0.8918	Nov 0.8963	Dec 0.9010 (40)
HLP (average)												0.8940 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan 82.3820	Feb 79.3863	Mar 76.3906	Apr 73.3949	May 70.3992	Jun 67.4035	Jul 67.4035	Aug 70.3992	Sep 73.3949	Oct 76.3906	Nov 79.3863	Dec 82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Southeast				6.2400	36.7938	0.6300	0.7000	0.7700	70.1668 (77)			
South				2.2100	46.7521	0.6300	0.7000	0.7700	31.5766 (78)			
Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains	421.2115	488.9806	537.3716	569.4289	581.3281	561.5651	541.7662	526.3621	510.2428	468.0154	419.7157	398.8747 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.2201	76.4380	76.6527	77.6780	77.8729	78.7931	78.7931	78.9659	78.4360	77.8729	77.4796	77.0728	
alpha	6.0813	6.0959	6.1102	6.1785	6.1915	6.2529	6.2529	6.2644	6.2291	6.1915	6.1653	6.1382	
util living area	0.9885	0.9719	0.9340	0.8448	0.6945	0.5064	0.3631	0.3897	0.5970	0.8637	0.9717	0.9913	(86)
MIT	20.3109	20.4822	20.6801	20.8674	20.9660	20.9959	20.9996	20.9993	20.9890	20.8704	20.5639	20.2768	(87)
Th 2	20.1581	20.1603	20.1624	20.1726	20.1745	20.1834	20.1834	20.1850	20.1800	20.1745	20.1707	20.1666	(88)
util rest of house	0.9851	0.9642	0.9172	0.8109	0.6422	0.4435	0.2960	0.3210	0.5307	0.8261	0.9627	0.9888	(89)
MIT 2	19.2552	19.5011	19.7776	20.0303	20.1446	20.1809	20.1832	20.1848	20.1725	20.0408	19.6284	19.2126	(90)
Living area fraction	19.7861	19.9945	20.2314	20.4513	20.5577	20.5907	20.5937	20.5944	20.5831	20.4580	20.0989	19.7477	(92)
Temperature adjustment	19.7861	19.9945	20.2314	20.4513	20.5577	20.5907	20.5937	20.5944	20.5831	20.4580	20.0989	19.7477	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	414.1915	470.6274	493.6920	468.6178	387.7457	266.7830	178.6577	187.1586	287.6369	393.0783	403.6675	393.7705	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	716.6180	696.5067	631.8341	524.5023	401.1892	268.1678	178.7745	187.3454	291.5290	446.4946	591.7431	711.5114	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	225.0053	151.7909	102.7777	40.2368	10.0020	0.0000	0.0000	0.0000	0.0000	39.7417	135.4144	236.3992	(98)
Space heating												941.3681	(98)
Space heating per m2												18.5345	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1006.8108 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	225.0053	151.7909	102.7777	40.2368	10.0020	0.0000	0.0000	0.0000	0.0000	39.7417	135.4144	236.3992	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	240.6474	162.3432	109.9227	43.0340	10.6973	0.0000	0.0000	0.0000	0.0000	42.5045	144.8282	252.8334	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	85.5818	84.8645	83.7183	81.9485	80.4391	79.8000	79.8000	79.8000	79.8000	81.8665	84.4723	85.7739	(216)
Fuel for water heating, kWh/month	197.1972	175.4993	187.3609	172.3273	172.5923	156.2471	150.8144	164.4484	163.8315	178.8360	182.3607	192.2615	(219)
Water heating fuel used												2093.7767	(219)
Annual totals kWh/year													
Space heating fuel - main system												1006.8108	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												3418.9638	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1006.8108	0.2160	217.4711 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2093.7767	0.2160	452.2558 (264)
Space and water heating			669.7269 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			834.9642 (272)
Emissions per m2 for space and water heating			13.1862 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.1862 * 1.55) + 2.4870 + 0.7664, rounded to 2 d.p.			23.6900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010549			Issued on Date	29/04/2022
Assessment Reference	115	Prop Type Ref			
Property					
SAP Rating	82 B	DER	14.10	TER	28.87
Environmental	91 B	% DER<TER	51.16		
CO ₂ Emissions (t/year)	0.57	DFEE	42.09	TFEE	48.31
General Requirements Compliance	Pass	% DFEE<TFEE	12.88		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 28.87 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.10 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 48.3 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 42.1 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room stats OK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing South East:	6.24 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Exposed floor U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	454.01 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			1.8900	1.0000	1.8900		(26)	
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)	
Exposed Floor			50.7900	0.1000	5.0790		(28b)	
External Wall	23.1000	8.4500	14.6500	0.1500	2.1975		(29a)	
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)	
Total net area of external elements Aum(A, m2)			91.3900				(31)	
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		22.7446		(33)	
Party Wall 1			33.8800	0.0000	0.0000		(32)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								11.3018 (36)
Total fabric heat loss						(33) + (36) =	34.0464 (37)	

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	11.1341	11.0123	10.8905	10.2816	10.1599	9.5510	9.5510	9.4292	9.7945	10.1599	10.4034	10.6470 (38)
Average = Sum(39)m / 12 =	45.1805	45.0587	44.9369	44.3280	44.2062	43.5974	43.5974	43.4756	43.8409	44.2062	44.4498	44.6933 (39)
	45.1805	45.0587	44.9369	44.3280	44.2062	43.5974	43.5974	43.4756	43.8409	44.2062	44.4498	44.2976 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8896	0.8872	0.8848	0.8728	0.8704	0.8584	0.8584	0.8560	0.8632	0.8704	0.8752	0.8800 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												
Average daily hot water use (litres/day)												1.7134 (42)
												74.8927 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy content (annual)	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1006.0882 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1127.8249 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	59.3592 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2050.5266 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	107.9225 (310b)
Electricity used for heat distribution	33.4563 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	238.1302 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	3705.7547 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1271.3406	0.5190	659.8258 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	168.9714	0.5190	87.6961 (368)
Electrical energy for heat distribution	33.4563	0.5190	17.3638 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			764.8858 (373)
Space and water heating			764.8858 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	238.1302	0.5190	123.5896 (379)
Energy saving/generation technologies			
PV Unit	-454.0100	0.5190	-235.6312 (380)
Total CO2, kg/year			716.1576 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.1000 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		14.1000 ZC1
Total Floor Area	TFA	50.7900
Assumed number of occupants	N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.4175 ZC2
CO2 emissions from cooking, equation (L16)		3.1526 ZC3
Total CO2 emissions		34.6701 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		34.6701 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 20.0000 / (5) = 0.1575 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4075 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
Effective ac	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)
Exposed Floor			50.7900	0.1300	6.6027		(28b)
External Wall	23.1000	8.4500	14.6500	0.1800	2.6370		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Total net area of external elements Aum(A, m ²)			91.3900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.1422		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.4576 (36)
Total fabric heat loss						(33) + (36) =	35.5998 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	24.3480	24.2160	24.0867	23.4794	23.3658	22.8368	22.8368	22.7389	23.0406	23.3658	23.5957	23.8360 (38)
Heat transfer coeff	59.9477	59.8158	59.6865	59.0792	58.9655	58.4366	58.4366	58.3386	58.6403	58.9655	59.1954	59.4357 (39)
Average = Sum(39)m / 12 =												59.0786 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1803	1.1777	1.1752	1.1632	1.1610	1.1506	1.1506	1.1486	1.1546	1.1610	1.1655	1.1702 (40)
HLP (average)												1.1632 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
Heat gains from water heating, kWh/month	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
Southeast					6.2400	36.7938	0.6300	0.7000	0.7700		70.1668 (77)	
South					2.2100	46.7521	0.6300	0.7000	0.7700		31.5766 (78)	
Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains	421.2115	488.9806	537.3716	569.4289	581.3281	561.5651	541.7662	526.3621	510.2428	468.0154	419.7157	398.8747 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	58.8360	58.9658	59.0935	59.7010	59.8160	60.3575	60.3575	60.4588	60.1477	59.8160	59.5837	59.3428	
alpha	4.9224	4.9311	4.9396	4.9801	4.9877	5.0238	5.0238	5.0306	5.0098	4.9877	4.9722	4.9562	
util living area	0.9918	0.9823	0.9617	0.9118	0.8078	0.6344	0.4686	0.5013	0.7247	0.9233	0.9824	0.9936 (86)	
MIT	19.9272	20.1119	20.3583	20.6391	20.8546	20.9672	20.9940	20.9916	20.9356	20.6657	20.2431	19.8906 (87)	
Th 2	19.9358	19.9379	19.9399	19.9495	19.9514	19.9598	19.9598	19.9613	19.9565	19.9514	19.9477	19.9439 (88)	
util rest of house	0.9892	0.9768	0.9497	0.8842	0.7513	0.5442	0.3610	0.3925	0.6397	0.8933	0.9760	0.9916 (89)	
MIT 2	18.5334	18.8011	19.1532	19.5461	19.8167	19.9392	19.9577	19.9581	19.9104	19.5909	19.0001	18.4861 (90)	
Living area fraction									fLA = Living area / (4) =			0.5029 (91)	
MIT	19.2343	19.4602	19.7592	20.0957	20.3386	20.4561	20.4788	20.4778	20.4260	20.1314	19.6252	19.1924 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.2343	19.4602	19.7592	20.0957	20.3386	20.4561	20.4788	20.4778	20.4260	20.1314	19.6252	19.1924 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9869	0.9737	0.9473	0.8885	0.7736	0.5886	0.4153	0.4474	0.6799	0.8992	0.9735	0.9896 (94)
Useful gains	415.6966	476.1120	509.0416	505.9325	449.7140	330.5185	225.0007	235.4759	346.9140	420.8275	408.5881	394.7386 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	895.2750	870.9304	791.3926	661.4342	509.3812	342.2120	226.6647	237.8957	370.9561	562.0240	741.4317	891.0821 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	356.8063	265.3179	210.0691	111.9612	44.3924	0.0000	0.0000	0.0000	0.0000	105.0502	239.6474	369.2796 (98)
Space heating												1702.5241 (98)
Space heating per m2										(98) / (4) =		33.5209 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1820.8814 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	356.8063	265.3179	210.0691	111.9612	44.3924	0.0000	0.0000	0.0000	0.0000	105.0502	239.6474	369.2796	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	381.6111	283.7625	224.6728	119.7446	47.4785	0.0000	0.0000	0.0000	0.0000	112.3532	256.3074	394.9514	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	86.7643	86.3379	85.5938	84.2025	82.1533	79.8000	79.8000	79.8000	79.8000	83.9464	85.9886	79.8000	(216)
Fuel for water heating, kWh/month	194.5098	172.5043	183.2555	167.7143	168.9910	156.2471	150.8144	164.4484	163.8315	174.4050	179.1450	189.7640	(219)
Water heating fuel used												2065.6302	(219)
Annual totals kWh/year													
Space heating fuel - main system												1820.8814	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												4204.8879	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1820.8814	0.2160	393.3104 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2065.6302	0.2160	446.1761 (264)
Space and water heating			839.4865 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			1004.7238 (272)
Emissions per m2 for space and water heating			16.5286 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.5286 * 1.55) + 2.4870 + 0.7664, rounded to 2 d.p.			28.8700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010550			Issued on Date	29/04/2022
Assessment Reference	116	Prop Type Ref			
Property					
SAP Rating	84 B	DER	11.06	TER	24.00
Environmental	93 A	% DER<TER	53.91		
CO ₂ Emissions (t/year)	0.48	DFEE	29.45	TFEE	31.81
General Requirements Compliance	Fail	% DFEE<TFEE	7.41		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 24.00 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 11.06 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)31.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)29.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing South East:	6.24 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	454.01 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

					main	secondary	other			total	m3 per hour			
					heating		heating							
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)		
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)		
Number of intermittent fans											0 * 10 =	0.0000 (7a)		
Number of passive vents											0 * 10 =	0.0000 (7b)		
Number of flueless gas fires											0 * 40 =	0.0000 (7c)		
											Air changes per hour			
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =										0.0000 / (5) =		0.0000 (8)		
Pressure test											Yes			
Measured/design AP50											3.0000			
Infiltration rate											0.1500		(18)	
Number of sides sheltered											3		(19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =		0.7750 (20)	
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =		0.1163 (21)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)		
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)		
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)		
Balanced mechanical ventilation with heat recovery														
If mechanical ventilation:												0.5000 (23a)		
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)		
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)		

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)					
External Wall	23.1000	8.4500	14.6500	0.1500	2.1975		(29a)					
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)					
Total net area of external elements Aum(A, m2)			40.6000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		17.6656		(33)					
Party Wall 1			33.8800	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.5610 (36)					
Total fabric heat loss							(33) + (36) = 23.2266 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 11.1341	Feb 11.0123	Mar 10.8905	Apr 10.2816	May 10.1599	Jun 9.5510	Jul 9.5510	Aug 9.4292	Sep 9.7945	Oct 10.1599	Nov 10.4034	Dec 10.6470 (38)
Heat transfer coeff	34.3607	34.2389	34.1171	33.5082	33.3864	32.7776	32.7776	32.6558	33.0211	33.3864	33.6300	33.8735 (39)
Average = Sum(39)m / 12 =	33.4778 (39)											
HLP	Jan 0.6765	Feb 0.6741	Mar 0.6717	Apr 0.6597	May 0.6573	Jun 0.6454	Jul 0.6454	Aug 0.6430	Sep 0.6501	Oct 0.6573	Nov 0.6621	Dec 0.6669 (40)
HLP (average)	0.6591 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan 82.3820	Feb 79.3863	Mar 76.3906	Apr 73.3949	May 70.3992	Jun 67.4035	Jul 67.4035	Aug 70.3992	Sep 73.3949	Oct 76.3906	Nov 79.3863	Dec 82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												

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Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (56)													
If cylinder contains dedicated solar storage													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (57)													
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month													
177.4469 156.7782 165.5372 149.6214 147.5136 133.0871 129.0318 139.9117 139.1394 155.0886 162.4461 173.5921 173.5921 (62)													
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
177.4469 156.7782 165.5372 149.6214 147.5136 133.0871 129.0318 139.9117 139.1394 155.0886 162.4461 173.5921 173.5921 (64)													
Total per year (kWh/year) = Sum(64)m =													1829.1942 (64)
Heat gains from water heating, kWh/month													
84.8430 75.4698 80.8830 74.7574 74.8902 69.2597 68.7450 72.3625 71.2721 77.4089 79.0216 83.5613 83.5613 (65)													

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
13.4839 11.9763 9.7398 7.3736 5.5119 4.6534 5.0281 6.5357 8.7723 11.1384 13.0002 13.8587 13.8587 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
149.2855 150.8347 146.9309 138.6204 128.1298 118.2701 111.6832 110.1341 114.0378 122.3484 132.8390 142.6987 142.6987 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 (69)													
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													
-68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 (71)													
Water heating gains (Table 5)													
114.0363 112.3063 108.7138 103.8297 100.6589 96.1941 92.3992 97.2615 98.9891 104.0442 109.7522 112.3135 112.3135 (72)													
Total internal gains	325.5065	323.8179	314.0852	298.5244	283.0012	267.8182	257.8112	262.6320	270.4999	286.2317	304.2921	317.5716	317.5716 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W	
Southeast					6.2400	36.7938	0.4000	0.8000			0.7700	50.9147 (77)	
South					2.2100	46.7521	0.4000	0.8000			0.7700	22.9127 (78)	

Solar gains	73.8274	124.2516	166.4633	201.0539	220.9821	217.6723	210.5612	195.8614	178.4200	136.3256	88.1434	63.3710 (83)	
Total gains	399.3338	448.0695	480.5485	499.5783	503.9832	485.4906	468.3724	458.4934	448.9198	422.5573	392.4355	380.9426 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
tau	102.6489	103.0140	103.3817	105.2603	105.6442	107.6067	107.6067	108.0079	106.8130	105.6442	104.8791	104.1250	104.1250
alpha	7.8433	7.8676	7.8921	8.0174	8.0429	8.1738	8.1738	8.2005	8.1209	8.0429	7.9919	7.9417	7.9417
util living area	0.9815	0.9564	0.9000	0.7778	0.6112	0.4318	0.3079	0.3276	0.5065	0.7854	0.9500	0.9860	0.9860 (86)
MIT	20.6320	20.7516	20.8740	20.9657	20.9950	20.9997	21.0000	21.0000	20.9991	20.9688	20.8079	20.6077	20.6077 (87)
Th 2	20.3616	20.3637	20.3659	20.3765	20.3787	20.3894	20.3894	20.3915	20.3851	20.3787	20.3744	20.3701	20.3701 (88)
util rest of house	0.9768	0.9465	0.8804	0.7457	0.5721	0.3908	0.2652	0.2843	0.4618	0.7482	0.9371	0.9823	0.9823 (89)
MIT 2	19.8820	20.0513	20.2176	20.3409	20.3744	20.3892	20.3893	20.3915	20.3844	20.3480	20.1406	19.8548	19.8548 (90)
Living area fraction									fLA = Living area / (4) =			0.5029	0.5029 (91)
MIT	20.2592	20.4034	20.5477	20.6551	20.6865	20.6962	20.6964	20.6975	20.6935	20.6601	20.4761	20.2334	20.2334 (92)
Temperature adjustment												0.0000	0.0000
adjusted MIT	20.2592	20.4034	20.5477	20.6551	20.6865	20.6962	20.6964	20.6975	20.6935	20.6601	20.4761	20.2334	20.2334 (93)

8. Space heating requirement

Utilisation	0.9760	0.9471	0.8864	0.7603	0.5916	0.4114	0.2867	0.3061	0.4843	0.7654	0.9394	0.9814	0.9814 (94)
Useful gains	389.7316	424.3886	425.9349	379.8513	298.1356	199.7359	134.2668	140.3312	217.4101	323.4429	368.6451	373.8417	373.8417 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	4.2000 (96)
Heat loss rate W	548.3668	530.8195	479.2663	393.8908	300.0260	199.8189	134.2703	140.3372	217.7251	335.8724	449.8393	543.1081	543.1081 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	118.0246	71.5216	39.6786	10.1084	1.4065	0.0000	0.0000	0.0000	0.0000	9.2475	58.4598	125.9343	125.9343 (98)
Space heating												434.3813	434.3813 (98)
Space heating per m2										(98) / (4) =		8.5525	8.5525 (99)

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8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	434.3813 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	486.9415 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	25.6285 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2050.5266 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	107.9225 (310b)
Electricity used for heat distribution	26.7102 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	238.1302 (332)
Energy saving/generation technologies (Appendices M, N and Q)	
Total delivered energy for all uses	3031.1405 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1014.9872	0.5190	526.7784 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	134.9000	0.5190	70.0131 (368)
Electrical energy for heat distribution	26.7102	0.5190	13.8626 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			610.6540 (373)
Space and water heating			610.6540 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	238.1302	0.5190	123.5896 (379)
Energy saving/generation technologies			
PV Unit	-454.0100	0.5190	-235.6312 (380)
Total CO2, kg/year			561.9259 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			11.0600 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			11.0600 ZC1
Total Floor Area		TFA	50.7900
Assumed number of occupants		N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			17.4175 ZC2
CO2 emissions from cooking, equation (L16)			3.1526 ZC3
Total CO2 emissions			31.6301 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			31.6301 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					20.0000 / (5) = 0.1575 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4075 (18)
					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
Effective ac	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900			(26)				
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027			(27)				
External Wall	23.1000	8.4500	14.6500	0.1800	2.6370			(29a)				
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098			(29a)				
Total net area of external elements Aum(A, m2)			40.6000					(31)				
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	18.5395		(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								4.2296 (36)				
Total fabric heat loss						(33) + (36) =		22.7691 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	24.3480	24.2160	24.0867	23.4794	23.3658	22.8368	22.8368	22.7389	23.0406	23.3658	23.5957	23.8360 (38)
	47.1170	46.9851	46.8558	46.2485	46.1348	45.6059	45.6059	45.5079	45.8096	46.1348	46.3647	46.6050 (39)
Average = Sum(39)m / 12 =												46.2479 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9277	0.9251	0.9225	0.9106	0.9083	0.8979	0.8979	0.8960	0.9019	0.9083	0.9129	0.9176 (40)
HLP (average)												0.9106 (40)
Days in month												
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)	Total = Sum(45)m =											1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												
Store volume												
a) If manufacturer declared loss factor is known (kWh/day):	1.3938 (48)											
Temperature factor from Table 2b	0.5400 (49)											
Enter (49) or (54) in (55)	0.7527 (55)											
Total storage loss												

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If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W
Southeast					6.2400	36.7938	0.6300	0.7000	0.7700			70.1668 (77)
South					2.2100	46.7521	0.6300	0.7000	0.7700			31.5766 (78)
Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains	421.2115	488.9806	537.3716	569.4289	581.3281	561.5651	541.7662	526.3621	510.2428	468.0154	419.7157	398.8747 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	74.8580	75.0681	75.2753	76.2638	76.4516	77.3383	77.3383	77.5048	76.9944	76.4516	76.0726	75.6803
alpha	5.9905	6.0045	6.0184	6.0843	6.0968	6.1559	6.1559	6.1670	6.1330	6.0968	6.0715	6.0454
util living area	0.9889	0.9730	0.9369	0.8513	0.7037	0.5153	0.3699	0.3969	0.6066	0.8695	0.9729	0.9916 (86)
MIT	20.2863	20.4588	20.6606	20.8552	20.9614	20.9951	20.9995	20.9992	20.9872	20.8591	20.5437	20.2519 (87)
Th 2	20.1440	20.1462	20.1484	20.1585	20.1604	20.1693	20.1693	20.1709	20.1658	20.1604	20.1566	20.1526 (88)
util rest of house	0.9856	0.9656	0.9205	0.8177	0.6508	0.4504	0.3003	0.3258	0.5385	0.8324	0.9641	0.9891 (89)
MIT 2	19.2087	19.4566	19.7392	20.0026	20.1264	20.1663	20.1691	20.1706	20.1571	20.0145	19.5885	19.1658 (90)
Living area fraction	19.7506	19.9606	20.2025	20.4313	20.5463	20.5831	20.5866	20.5872	20.5745	20.4392	20.0688	19.7120 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7506	19.9606	20.2025	20.4313	20.5463	20.5831	20.5866	20.5872	20.5745	20.4392	20.0688	19.7120 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9838	0.9637	0.9217	0.8292	0.6757	0.4829	0.3353	0.3616	0.5724	0.8456	0.9630	0.9875 (94)
Useful gains	414.3677	471.2247	495.2826	472.1728	392.8082	271.2034	181.6682	190.3214	292.0435	395.7686	404.2071	393.8892 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	727.9850	707.6224	642.0408	533.3063	408.1214	272.8626	181.8138	190.5525	296.5960	453.9310	601.2941	722.9350 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	233.3313	158.8593	109.1881	44.0161	11.3930	0.0000	0.0000	0.0000	0.0000	43.2728	141.9026	244.8100 (98)
Space heating												986.7733 (98)
Space heating per m2										(98) / (4) =		19.4285 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1055.3725 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	233.3313	158.8593	109.1881	44.0161	11.3930	0.0000	0.0000	0.0000	0.0000	43.2728	141.9026	244.8100	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	249.5522	169.9030	116.7787	47.0761	12.1850	0.0000	0.0000	0.0000	0.0000	46.2811	151.7675	261.8289	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	85.6783	84.9860	83.8697	82.1068	80.5220	79.8000	79.8000	79.8000	79.8000	82.0121	84.5958	85.8659	(216)
Fuel for water heating, kWh/month	196.9753	175.2483	187.0226	171.9951	172.4146	156.2471	150.8144	164.4484	163.8315	178.5184	182.0944	192.0554	(219)
Water heating fuel used												2091.6656	(219)
Annual totals kWh/year													
Space heating fuel - main system												1055.3725	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												3465.4144	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1055.3725	0.2160	227.9605 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2091.6656	0.2160	451.7998 (264)
Space and water heating			679.7602 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			844.9975 (272)
Emissions per m2 for space and water heating			13.3837 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.3837 * 1.55) + 2.4870 + 0.7664, rounded to 2 d.p.			24.0000 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010551			Issued on Date	29/04/2022
Assessment Reference	117	Prop Type Ref			
Property					
SAP Rating	84 B	DER	11.18	TER	21.86
Environmental	92 A	% DER<TER	48.85		
CO ₂ Emissions (t/year)	0.67	DFEE	31.81	TFEE	35.64
General Requirements Compliance	Fail	% DFEE<TFEE	10.73		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 74 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 21.86 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 11.18 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)35.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)31.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading: Average
Windows facing South East: 6.24 m², No overhang
Windows facing South: 2.21 m², No overhang
Windows facing South West: 9.35 m², No overhang
Windows facing West: 1.97 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 454.01 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

					main heating	+	secondary heating	+	other	=	total	m3 per hour
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =										0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50											3.0000	
Infiltration rate											0.1500	(18)
Number of sides sheltered											2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =										0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =										0.1275	(21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			19.7700	1.1450	22.6374		(27)					
External Wall	52.9500	19.7700	33.1800	0.1500	4.9770		(29a)					
Corridor	5.4000	1.8900	3.5100	0.2500	0.8775		(29a)					
Total net area of external elements Aum(A, m2)			58.3500				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =			30.3819	(33)					
Party Wall 1			34.8500	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.1430 (36)					
Total fabric heat loss							(33) + (36) = 39.5249 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 17.2447	Feb 17.0514	Mar 16.8580	Apr 15.8913	May 15.6980	Jun 14.7313	Jul 14.7313	Aug 14.5380	Sep 15.1180	Oct 15.6980	Nov 16.0847	Dec 16.4714 (38)
Heat transfer coeff	56.7696	56.5763	56.3829	55.4163	55.2229	54.2562	54.2562	54.0629	54.6429	55.2229	55.6096	55.9963 (39)
Average = Sum(39)m / 12 =	55.3679 (39)											
HLP	Jan 0.7722	Feb 0.7695	Mar 0.7669	Apr 0.7538	May 0.7511	Jun 0.7380	Jul 0.7380	Aug 0.7353	Sep 0.7432	Oct 0.7511	Nov 0.7564	Dec 0.7616 (40)
HLP (average)	0.7531 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	Jan 98.4511	Feb 94.8710	Mar 91.2910	Apr 87.7110	May 84.1309	Jun 80.5509	Jul 80.5509	Aug 84.1309	Sep 87.7110	Oct 91.2910	Nov 94.8710	Dec 98.4511 (44)
Energy conte	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Energy content (annual)												Total = Sum(45)m = 1408.1991 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (56)													
If cylinder contains dedicated solar storage													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (57)													
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month													
201.2769 177.6201 187.0442 168.3717 165.5050 148.6122 143.4181 156.4202 155.8451 174.5575 183.6979 196.6701 196.6701 (62)													
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
201.2769 177.6201 187.0442 168.3717 165.5050 148.6122 143.4181 156.4202 155.8451 174.5575 183.6979 196.6701 196.6701 (64)													
Total per year (kWh/year) = Sum(64)m =													2059.0388 (64)
Heat gains from water heating, kWh/month													
92.7665 82.3997 88.0341 80.9919 80.8723 74.4219 73.5284 77.8516 76.8268 83.8823 86.0878 91.2347 (65)													

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)													
(66)m 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 (66)													
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
18.3088 16.2617 13.2249 10.0121 7.4842 6.3185 6.8273 8.8744 11.9112 15.1240 17.6520 18.8177 18.8177 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
205.3693 207.5004 202.1301 190.6974 176.2657 162.7019 153.6405 151.5094 156.8797 168.3123 182.7441 196.3078 196.3078 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 (69)													
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													
-93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 (71)													
Water heating gains (Table 5)													
124.6861 122.6187 118.3254 112.4887 108.6993 103.3637 98.8285 104.6393 106.7039 112.7450 119.5664 122.6273 122.6273 (72)													
Total internal gains													
406.2912 404.3077 391.6074 371.1252 350.3761 330.3110 317.2233 322.9500 333.4217 354.1083 377.8894 395.6798 395.6798 (73)													

6. Solar gains

[Jan]													
Area m2													
Solar flux Table 6a W/m2													
Specific data or Table 6b													
Specific data or Table 6c													
Access factor Table 6d													
Gains W													
Southeast	6.2400	36.7938	0.4000	0.8000	0.7700	50.9147 (77)							
South	2.2100	46.7521	0.4000	0.8000	0.7700	22.9127 (78)							
Southwest	9.3500	36.7938	0.4000	0.8000	0.7700	76.2904 (79)							
West	1.9700	19.6403	0.4000	0.8000	0.7700	8.5802 (80)							
Solar gains	158.6979	270.9870	371.9096	461.6762	517.1520	513.2277	494.8979	453.6712	403.0932	299.8653	190.2202	135.7156 (83)	
Total gains	564.9891	675.2948	763.5169	832.8014	867.5282	843.5387	812.1211	776.6213	736.5149	653.9736	568.1096	531.3954 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)													
tau 89.9347 90.2420 90.5514 92.1310 92.4536 94.1008 94.1008 94.4373 93.4349 92.4536 91.8107 91.1767 91.1767 (86)													
alpha 6.9956 7.0161 7.0368 7.1421 7.1636 7.2734 7.2734 7.2958 7.2290 7.1636 7.1207 7.0784 7.0784 (86)													
util living area 0.9890 0.9652 0.9034 0.7649 0.5863 0.4113 0.2939 0.3202 0.5099 0.8137 0.9678 0.9923 (86)													
MIT 20.4660 20.6444 20.8245 20.9538 20.9932 20.9996 21.0000 20.9999 20.9980 20.9419 20.6929 20.4317 (87)													
Th 2 20.2775 20.2798 20.2821 20.2936 20.2959 20.3074 20.3074 20.3097 20.3028 20.2959 20.2913 20.2867 (88)													
util rest of house 0.9859 0.9565 0.8831 0.7298 0.5439 0.3669 0.2477 0.2722 0.4593 0.7747 0.9582 0.9901 (89)													
MIT 2 19.5743 19.8291 20.0754 20.2460 20.2901 20.3071 20.3074 20.3097 20.3014 20.2378 19.9100 19.5323 (90)													
Living area fraction fLA = Living area / (4) =													
MIT 19.9022 20.1289 20.3509 20.5063 20.5487 20.5618 20.5621 20.5636 20.5576 20.4967 20.1979 19.8631 (92)													
Temperature adjustment 0.0000													
adjusted MIT 19.9022 20.1289 20.3509 20.5063 20.5487 20.5618 20.5621 20.5636 20.5576 20.4967 20.1979 19.8631 (93)													

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.9840 0.9544 0.8852 0.7407 0.5592 0.3832 0.2647 0.2898 0.4779 0.7863 0.9568 0.9884 (94)													
Useful gains	555.9318	644.5010	675.8881	616.8285	485.1215	323.2778	214.9595	225.0750	351.9614	514.2465	543.5409	525.2536 (95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W	885.7334	861.5951	780.9539	643.1784	488.6489	323.4649	214.9695	225.0940	352.8633	546.5273	728.3705	877.0750 (97)	
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)	
Space heating kWh	245.3724	145.8872	78.1690	18.9719	2.6244	0.0000	0.0000	0.0000	0.0000	24.0169	133.0773	261.7551 (98)	
Space heating													
Space heating per m2													
(98) / (4) =													12.3759 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	909.8743 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1019.9690 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	53.6826 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2059.0388 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2308.1825 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	121.4833 (310b)
Electricity used for heat distribution	35.0332 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	170.9800 (330a)
Total electricity for the above, kWh/year	170.9800 (331)
Electricity for lighting (calculated in Appendix L)	323.3395 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	3997.6369 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1331.2606	0.5190	690.9243 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	176.9352	0.5190	91.8294 (368)
Electrical energy for heat distribution	35.0332	0.5190	18.1822 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			800.9359 (373)
Space and water heating			800.9359 (376)
Pumps and fans	170.9800	0.5190	88.7386 (378)
Energy for lighting	323.3395	0.5190	167.8132 (379)
Energy saving/generation technologies			
PV Unit	-454.0100	0.5190	-235.6312 (380)
Total CO2, kg/year			821.8565 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			11.1800 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			11.1800 ZC1
Total Floor Area		TFA	73.5200
Assumed number of occupants		N	2.3285
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.5530 ZC2
CO2 emissions from cooking, equation (L16)			2.3787 ZC3
Total CO2 emissions			30.1117 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			30.1117 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					30.0000 / (5) = 0.1632 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4132 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3512 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4478	0.4390	0.4303	0.3864	0.3776	0.3337	0.3337	0.3249	0.3512	0.3776	0.3951	0.4127 (22b)
Effective ac	0.6003	0.5964	0.5926	0.5746	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			16.4900	1.3258	21.8617		(27)					
External Wall	52.9500	16.4900	36.4600	0.1800	6.5628		(29a)					
Corridor	5.4000	1.8900	3.5100	0.1800	0.6318		(29a)					
Total net area of external elements Aum(A, m2)			58.3500				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.9463		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.0636 (36)					
Total fabric heat loss						(33) + (36) =	38.0099 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 36.4091	Feb 36.1729	Mar 35.9414	Apr 34.8541	May 34.6506	Jun 33.7036	Jul 33.7036	Aug 33.5282	Sep 34.0684	Oct 34.6506	Nov 35.0622	Dec 35.4924 (38)
Heat transfer coeff	74.4190	74.1828	73.9514	72.8640	72.6606	71.7135	71.7135	71.5382	72.0783	72.6606	73.0721	73.5024 (39)
Average = Sum(39)m / 12 =												72.8630 (39)
HLP	Jan 1.0122	Feb 1.0090	Mar 1.0059	Apr 0.9911	May 0.9883	Jun 0.9754	Jul 0.9754	Aug 0.9730	Sep 0.9804	Oct 0.9883	Nov 0.9939	Dec 0.9998 (40)
HLP (average)												0.9911 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy conte	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Energy content (annual)										Total = Sum(45)m =		1408.1991 (45)
Distribution loss (46)m = 0.15 x (45)m	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
	85.8210	76.1264	81.0886	74.2704	73.9268	67.7004	66.5829	70.9061	70.1053	76.9367	79.3664	84.2892 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3070	16.2601	13.2236	10.0111	7.4834	6.3178	6.8266	8.8735	11.9100	15.1225	17.6502	18.8158	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	(71)
Water heating gains (Table 5)	115.3508	113.2833	108.9900	103.1533	99.3640	94.0283	89.4931	95.3039	97.3685	103.4096	110.2311	113.2919	(72)
Total internal gains	399.9539	397.9707	385.2706	364.7888	344.0400	323.9750	310.8872	316.6137	327.0851	347.7714	371.5522	389.3425	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g	Specific data or Table 6b	FF	Specific data or Table 6c	Access factor Table 6d	Gains W		
Southeast				5.2100	36.7938		0.6300		0.7000	0.7700	58.5847	(77)	
South				1.8400	46.7521		0.6300		0.7000	0.7700	26.2900	(78)	
Southwest				7.8000	36.7938		0.6300		0.7000	0.7700	87.7085	(79)	
West				1.6400	19.6403		0.6300		0.7000	0.7700	9.8438	(80)	
Solar gains	182.4270	311.5043	427.5134	530.6984	594.4675	589.9567	568.8863	521.4963	463.3582	344.6994	218.6622	156.0085	(83)
Total gains	582.3809	709.4749	812.7841	895.4872	938.5075	913.9316	879.7735	838.1100	790.4433	692.4707	590.2145	545.3510	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6055	68.8239	69.0394	70.0696	70.2658	71.1937	71.1937	71.3683	70.8334	70.2658	69.8701	69.4611	
alpha	5.5737	5.5883	5.6026	5.6713	5.6844	5.7462	5.7462	5.7579	5.7222	5.6844	5.6580	5.6307	
util living area	0.9922	0.9772	0.9390	0.8434	0.6850	0.4974	0.3580	0.3915	0.6120	0.8849	0.9800	0.9944	(86)
MIT	20.1287	20.3430	20.5945	20.8337	20.9567	20.9942	20.9993	20.9988	20.9820	20.8119	20.4251	20.0904	(87)
Th 2	20.0732	20.0758	20.0784	20.0908	20.0931	20.1039	20.1039	20.1059	20.0997	20.0931	20.0884	20.0835	(88)
util rest of house	0.9898	0.9706	0.9225	0.8076	0.6290	0.4299	0.2855	0.3160	0.5391	0.8487	0.9731	0.9926	(89)
MIT 2	18.9267	19.2363	19.5898	19.9131	20.0555	20.1004	20.1036	20.1054	20.0875	19.8964	19.3668	18.8791	(90)
Living area fraction	19.3688	19.6434	19.9593	20.2517	20.3869	20.4291	20.4330	20.4340	20.4165	20.2331	19.7560	19.3246	(92)
Temperature adjustment	19.3688	19.6434	19.9593	20.2517	20.3869	20.4291	20.4330	20.4340	20.4165	20.2331	19.7560	19.3246	(93)
adjusted MIT	19.3688	19.6434	19.9593	20.2517	20.3869	20.4291	20.4330	20.4340	20.4165	20.2331	19.7560	19.3246	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9874	0.9668	0.9201	0.8144	0.6477	0.4546	0.3122	0.3438	0.5653	0.8549	0.9700	0.9907	(94)
Ext temp.	575.0202	685.9200	747.8324	729.2656	607.8729	415.4799	274.6429	288.1747	446.8606	592.0102	572.4993	540.2693	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1121.4021	1093.7042	995.3329	827.1285	631.1973	418.0258	274.8792	288.5832	455.2835	699.9457	924.8020	1111.6934	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	406.5081	274.0310	184.1403	70.4612	17.3534	0.0000	0.0000	0.0000	0.0000	80.3041	253.6580	425.1395	(98)
Space heating per m2												1711.5957	(98)
												23.2807	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1830.5836 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	406.5081	274.0310	184.1403	70.4612	17.3534	0.0000	0.0000	0.0000	0.0000	80.3041	253.6580	425.1395	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	434.7680	293.0813	196.9415	75.3596	18.5598	0.0000	0.0000	0.0000	0.0000	85.8867	271.2920	454.6947	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882	(64)
Efficiency of water heater (217)m	86.7602	86.0844	84.8989	82.7932	80.7512	79.8000	79.8000	79.8000	79.8000	83.0011	85.7986	86.9264	(216)
Fuel for water heating, kWh/month	221.9854	197.2232	210.0879	193.2161	194.2052	175.7022	168.8423	185.1357	184.7660	199.8474	204.3109	216.2615	(219)
Water heating fuel used												2351.5838	(219)
Annual totals kWh/year													
Space heating fuel - main system												1830.5836	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												323.3067	(232)
Total delivered energy for all uses												4580.4741	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1830.5836	0.2160	395.4061 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2351.5838	0.2160	507.9421 (264)
Space and water heating			903.3481 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	323.3067	0.5190	167.7962 (268)
Total CO2, kg/m2/year			1110.0693 (272)
Emissions per m2 for space and water heating			12.2871 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.2823 (272b)
Emissions per m2 for pumps and fans			0.5294 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.2871 * 1.55) + 2.2823 + 0.5294, rounded to 2 d.p.			21.8600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010552				Issued on Date	29/04/2022
Assessment Reference	118	Prop Type Ref				
Property						
SAP Rating	84 B	DER	12.78	TER	24.45	
Environmental	91 B	% DER<TER	47.73			
CO ₂ Emissions (t/year)	0.72	DFEE	38.89	TFEE	43.38	
General Requirements Compliance	Pass	% DFEE<TFEE	10.35			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aecom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 24.45 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.78 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 43.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 38.9 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room stats OK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading: Average
Windows facing West: 5.88 m², No overhang
Windows facing North West: 7.07 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 454.01 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												75.6500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			12.9500	1.1450	14.8282		(27)
External Wall	35.0800	12.9500	22.1300	0.1500	3.3195		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Core	18.2300		18.2300	0.2500	4.5575		(29a)
Total net area of external elements Aum(A, m ²)			70.8100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	28.4977			(33)
Party Wall 1			18.3000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.0220 (36)
Total fabric heat loss							(33) + (36) = 37.5197 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	17.0688	16.8774	16.6860	15.7292	15.5379	14.5811	14.5811	14.3897	14.9638	15.5379	15.9206	16.3033 (38)
Heat transfer coeff	54.5885	54.3972	54.2058	53.2490	53.0576	52.1008	52.1008	51.9094	52.4835	53.0576	53.4403	53.8231 (39)
Average = Sum(39)m / 12 =												53.2011 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7502	0.7475	0.7449	0.7317	0.7291	0.7160	0.7160	0.7133	0.7212	0.7291	0.7344	0.7396 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy content (annual)	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1401.8427 (45)
	21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
	Solar input (sum of months) = Sum (63)m =											0.0000 (63)	
Output from w/h													
	200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(64)
	Total per year (kWh/year) = Sum (64)m =											2052.6825 (64)	
Heat gains from water heating, kWh/month													
	92.5474	82.2081	87.8363	80.8195	80.7069	74.2791	73.3961	77.6998	76.6732	83.7032	85.8924	91.0225	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726 (66)
Lighting gains	(calculated in Appendix L, equation L9 or L9a), also see Table 5											
	18.2553	16.2142	13.1863	9.9829	7.4623	6.3000	6.8074	8.8485	11.8764	15.0798	17.6004	18.7627 (67)
Appliances gains	(calculated in Appendix L, equation L13 or L13a), also see Table 5											
	203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872 (68)
Cooking gains	(calculated in Appendix L, equation L15 or L15a), also see Table 5											
	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581 (71)
Water heating gains (Table 5)												
	124.3916	122.3335	118.0596	112.2492	108.4770	103.1654	98.6507	104.4353	106.4905	112.5044	119.2950	122.3421 (72)
Total internal gains												
	403.9925	402.0068	389.3790	369.0270	348.4216	328.4959	315.5019	321.2141	331.6232	352.1788	375.8026	393.4637 (73)

[Jan											Area		Solar flux		g		FF		Access		Gains		
											m2		Table 6a		or Table 6b		or Table 6c		factor		W		
																			Table 6d				
West											5.8800	19.6403		0.4000		0.8000		0.7700		25.6099		(80)	
Northwest											7.0700	11.2829		0.4000		0.8000		0.7700		17.6899		(81)	
Solar gains	43.2998	86.1067	147.3804	226.8726	290.6833	303.6424	286.5514	237.3201	175.0084	103.4509	54.1910	35.5068	(83)										
Total gains	447.2923	488.1134	536.7594	595.8996	639.1049	632.1383	602.0533	558.5342	506.6316	455.6297	429.9935	428.9705	(84)										

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil/m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	92.5739	92.8996	93.2275	94.9027	95.2450	96.9941	96.9941	97.3517	96.2868	95.2450	94.5629	93.8905
alpha	7.1716	7.1933	7.2152	7.3268	7.3497	7.4663	7.4663	7.4901	7.4191	7.3497	7.3042	7.2594
util living area	0.9969	0.9933	0.9788	0.9113	0.7424	0.5254	0.3806	0.4271	0.6968	0.9465	0.9921	0.9977 (86)
MIT	20.3517	20.4556	20.6369	20.8586	20.9735	20.9981	20.9999	20.9997	20.9873	20.8315	20.5585	20.3357 (87)
Th 2	20.2967	20.2990	20.3013	20.3129	20.3152	20.3268	20.3268	20.3291	20.3221	20.3152	20.3106	20.3060 (88)
util rest of house	0.9960	0.9913	0.9725	0.8884	0.6968	0.4711	0.3225	0.3650	0.6355	0.9271	0.9894	0.9969 (89)
MIT 2	19.4247	19.5774	19.8398	20.1526	20.2910	20.3256	20.3267	20.3289	20.3127	20.1247	19.7368	19.4087 (90)
Living area fraction									fLA = Living area / (4) =			0.3848 (91)
MIT	19.7814	19.9153	20.1465	20.4242	20.5536	20.5843	20.5857	20.5870	20.5723	20.3967	20.0530	19.7654 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7814	19.9153	20.1465	20.4242	20.5536	20.5843	20.5857	20.5870	20.5723	20.3967	20.0530	19.7654 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9951	0.9899	0.9708	0.8924	0.7131	0.4919	0.3448	0.3889	0.6587	0.9297	0.9881	0.9962 (94)
Useful gains	445.0837	483.2012	521.0751	531.7905	455.7241	310.9803	207.6105	217.2325	333.7154	423.6168	424.8654	427.3403 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
	845.1055	816.7890	739.7207	613.6529	469.7512	311.7893	207.6586	217.3455	339.6882	519.7883	692.2114	837.7750 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
	297.6162	224.1709	162.6724	58.9409	10.4362	0.0000	0.0000	0.0000	0.0000	71.5516	192.4891	305.3634 (98)
Space heating												1323.2408 (99)
Space heating per m2												18.1839 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1323.2408 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1483.3529 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	78.0712 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2052.6825 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2301.0570 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	121.1083 (310b)
Electricity used for heat distribution	39.8359 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	169.2357 (330a)
Total electricity for the above, kWh/year	169.2357 (331)
Electricity for lighting (calculated in Appendix L)	322.3944 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	4475.2195 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1513.7640	0.5190	785.6435 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	201.1914	0.5190	104.4183 (368)
Electrical energy for heat distribution	39.8359	0.5190	20.6748 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			910.7367 (373)
Space and water heating			910.7367 (376)
Pumps and fans	169.2357	0.5190	87.8333 (378)
Energy for lighting	322.3944	0.5190	167.3227 (379)
Energy saving/generation technologies			
PV Unit	-454.0100	0.5190	-235.6312 (380)
Total CO2, kg/year			930.2615 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			12.7800 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		12.7800 ZC1
Total Floor Area	TFA	72.7700
Assumed number of occupants	N	2.3115
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.5855 ZC2
CO2 emissions from cooking, equation (L16)		2.3976 ZC3
Total CO2 emissions		31.7631 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		31.7631 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1649 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4149 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3527 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4497	0.4408	0.4320	0.3879	0.3791	0.3350	0.3350	0.3262	0.3527	0.3791	0.3968	0.4144 (22b)
Effective ac	0.6011	0.5972	0.5933	0.5752	0.5719	0.5561	0.5561	0.5532	0.5622	0.5719	0.5787	0.5859 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			12.9500	1.3258	17.1686		(27)
External Wall	35.0800	12.9500	22.1300	0.1800	3.9834		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Core	18.2300		18.2300	0.1800	3.2814		(29a)
Total net area of external elements Aum(A, m ²)			70.8100				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	29.1332	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.9308 (36)
Total fabric heat loss						(33) + (36) =	36.0640 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.0868	35.8511	35.6201	34.5351	34.3321	33.3870	33.3870	33.2120	33.7511	34.3321	34.7427	35.1721 (38)
Heat transfer coeff	72.1507	71.9151	71.6841	70.5990	70.3960	69.4510	69.4510	69.2760	69.8150	70.3960	70.8067	71.2360 (39)
Average = Sum(39)m / 12 =												70.5981 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9915	0.9883	0.9851	0.9702	0.9674	0.9544	0.9544	0.9520	0.9594	0.9674	0.9730	0.9789 (40)
HLP (average)												0.9702 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)										Total = Sum(45)m =		1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m	21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (64)
Heat gains from water heating, kWh/month	85.6018	75.9347	80.8908	74.0980	73.7613	67.5576	66.4506	70.7543	69.9517	76.7577	79.1709	84.0770 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5798	16.5024	13.4206	10.1603	7.5949	6.4120	6.9283	9.0057	12.0875	15.3478	17.9132	19.0961 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581 (71)
Water heating gains (Table 5)	115.0562	112.9981	108.7242	102.9139	99.1416	93.8300	89.3153	95.0999	97.1551	103.1690	109.9597	113.0067 (72)
Total internal gains	397.9816	395.9596	383.2780	362.8690	342.2188	322.2725	309.2875	315.0360	325.4989	346.1114	369.7800	387.4618 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W	
West				5.8800	19.6403	0.6300	0.7000	0.7700			35.2936 (80)	
Northwest				7.0700	11.2829	0.6300	0.7000	0.7700			24.3789 (81)	
Solar gains	59.6725	118.6657	203.1086	312.6588	400.5979	418.4572	394.9036	327.0568	241.1834	142.5683	74.6819	48.9328 (83)
Total gains	457.6541	514.6253	586.3866	675.5278	742.8167	740.7297	704.1911	642.0927	566.6823	488.6797	444.4619	436.3946 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	70.0405	70.2700	70.4965	71.5799	71.7863	72.7631	72.7631	72.9469	72.3837	71.7863	71.3700	70.9398
alpha	5.6694	5.6847	5.6998	5.7720	5.7858	5.8509	5.8509	5.8631	5.8256	5.7858	5.7580	5.7293
util living area	0.9974	0.9944	0.9829	0.9322	0.7939	0.5876	0.4321	0.4922	0.7762	0.9657	0.9943	0.9980 (86)
MIT	20.0054	20.1409	20.3839	20.7004	20.9132	20.9876	20.9982	20.9964	20.9441	20.6527	20.2768	19.9860 (87)
Th 2	20.0904	20.0931	20.0958	20.1083	20.1106	20.1215	20.1215	20.1235	20.1173	20.1106	20.1059	20.1009 (88)
util rest of house	0.9966	0.9926	0.9772	0.9107	0.7416	0.5123	0.3468	0.4006	0.7028	0.9505	0.9921	0.9974 (89)
MIT 2	18.7606	18.9600	19.3132	19.7641	20.0301	20.1137	20.1209	20.1221	20.0746	19.7097	19.1685	18.7402 (90)
Living area fraction									fLA = Living area / (4) =			0.3848 (91)
MIT	19.2396	19.4144	19.7252	20.1244	20.3699	20.4500	20.4585	20.4585	20.4091	20.0725	19.5949	19.2195 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2396	19.4144	19.7252	20.1244	20.3699	20.4500	20.4585	20.4585	20.4091	20.0725	19.5949	19.2195 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	455.5995	509.9002	571.3143	615.4939	562.8862	400.7338	267.3910	279.9062	412.9322	464.0786	440.2215	434.8744 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1077.9007	1043.8037	948.0355	792.4307	610.3267	406.2875	267.9740	281.1579	440.4709	666.8277	884.7255	1069.9306 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	462.9920	358.7832	280.2806	127.3945	35.2957	0.0000	0.0000	0.0000	0.0000	150.8453	320.0428	472.4818 (98)
Space heating												2208.1159 (98)
Space heating per m2										(98) / (4) =		30.3438 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2361.6213 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	462.9920	358.7832	280.2806	127.3945	35.2957	0.0000	0.0000	0.0000	0.0000	150.8453	320.0428	472.4818	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	495.1787	383.7253	299.7653	136.2508	37.7494	0.0000	0.0000	0.0000	0.0000	161.3319	342.2918	505.3281	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500	(64)
Efficiency of water heater (217)m	87.0782	86.7714	86.0235	84.2225	81.5766	79.8000	79.8000	79.8000	79.8000	84.5703	86.4087	79.8000	(216)
Fuel for water heating, kWh/month	220.4179	194.9973	206.6499	189.3215	191.6304	175.1642	168.3438	184.5636	184.1870	195.5026	202.1884	214.8980	(219)
Water heating fuel used												2327.8648	(219)
Annual totals kWh/year													
Space heating fuel - main system												2361.6213	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												328.1242	(232)
Total delivered energy for all uses												5092.6103	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2361.6213	0.2160	510.1102 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2327.8648	0.2160	502.8188 (264)
Space and water heating			1012.9290 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	328.1242	0.5190	170.2965 (268)
Total CO2, kg/m2/year			1222.1505 (272)
Emissions per m2 for space and water heating			13.9196 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3402 (272b)
Emissions per m2 for pumps and fans			0.5349 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.9196 * 1.55) + 2.3402 + 0.5349, rounded to 2 d.p.			24.4500 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010553				Issued on Date	29/04/2022
Assessment Reference	119	Prop Type Ref				
Property						
SAP Rating	84 B	DER	13.13	TER	25.12	
Environmental	91 B	% DER<TER	47.73			
CO ₂ Emissions (t/year)	0.74	DFEE	40.31	TFEE	45.34	
General Requirements Compliance	Pass	% DFEE<TFEE	11.09			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 25.12 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.13 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 45.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 40.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK
Based on:
Overshading: Average
Windows facing North: 5.88 m², No overhang
Windows facing North West: 7.07 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 454.01 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												75.6500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			12.9500	1.1450	14.8282		(27)
External Wall	35.0800	12.9500	22.1300	0.1500	3.3195		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Core	18.2300		18.2300	0.2500	4.5575		(29a)
Total net area of external elements Aum(A, m ²)			70.8100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	28.4977			(33)
Party Wall 1			18.3000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.0220 (36)
Total fabric heat loss							(33) + (36) = 37.5197 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	17.0688	16.8774	16.6860	15.7292	15.5379	14.5811	14.5811	14.3897	14.9638	15.5379	15.9206	16.3033 (38)
Heat transfer coeff	54.5885	54.3972	54.2058	53.2490	53.0576	52.1008	52.1008	51.9094	52.4835	53.0576	53.4403	53.8231 (39)
Average = Sum(39)m / 12 =												53.2011 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7502	0.7475	0.7449	0.7317	0.7291	0.7160	0.7160	0.7133	0.7212	0.7291	0.7344	0.7396 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy content (annual)	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1401.8427 (45)
	21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1416.0686 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1587.4129 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	83.5480 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2052.6825 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2301.0570 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	121.1083 (310b)
Electricity used for heat distribution	40.9313 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	169.2357 (330a)
Total electricity for the above, kWh/year	169.2357 (331)
Electricity for lighting (calculated in Appendix L)	322.3944 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	4584.7563 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1555.3880	0.5190	807.2464 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	206.7235	0.5190	107.2895 (368)
Electrical energy for heat distribution	40.9313	0.5190	21.2433 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			935.7792 (373)
Space and water heating			935.7792 (376)
Pumps and fans	169.2357	0.5190	87.8333 (378)
Energy for lighting	322.3944	0.5190	167.3227 (379)
Energy saving/generation technologies			
PV Unit	-454.0100	0.5190	-235.6312 (380)
Total CO2, kg/year			955.3040 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			13.1300 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER	13.1300 ZC1
Total Floor Area	72.7700 TFA
Assumed number of occupants	2.3115 N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190 EF
CO2 emissions from appliances, equation (L14)	16.5855 ZC2
CO2 emissions from cooking, equation (L16)	2.3976 ZC3
Total CO2 emissions	32.1131 ZC4
Residual CO2 emissions offset from biofuel CHP	0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year	0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000 ZC7
Net CO2 emissions	32.1131 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 30.0000 / (5) = 0.1649 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4149 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3527 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4497	0.4408	0.4320	0.3879	0.3791	0.3350	0.3350	0.3262	0.3527	0.3791	0.3968	0.4144 (22b)
Effective ac	0.6011	0.5972	0.5933	0.5752	0.5719	0.5561	0.5561	0.5532	0.5622	0.5719	0.5787	0.5859 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			12.9500	1.3258	17.1686		(27)
External Wall	35.0800	12.9500	22.1300	0.1800	3.9834		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Core	18.2300		18.2300	0.1800	3.2814		(29a)
Total net area of external elements Aum(A, m ²)			70.8100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.1332		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.9308 (36)
Total fabric heat loss						(33) + (36) =	36.0640 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.0868	35.8511	35.6201	34.5351	34.3321	33.3870	33.3870	33.2120	33.7511	34.3321	34.7427	35.1721 (38)
Heat transfer coeff												
Average = Sum(39)m / 12 =	72.1507	71.9151	71.6841	70.5990	70.3960	69.4510	69.4510	69.2760	69.8150	70.3960	70.8067	71.2360 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9915	0.9883	0.9851	0.9702	0.9674	0.9544	0.9544	0.9520	0.9594	0.9674	0.9730	0.9789 (40)
HLP (average)												0.9702 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)										Total = Sum(45)m =		1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m	21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (64)
Heat gains from water heating, kWh/month	85.6018	75.9347	80.8908	74.0980	73.7613	67.5576	66.4506	70.7543	69.9517	76.7577	79.1709	84.0770 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5798	16.5024	13.4206	10.1603	7.5949	6.4120	6.9283	9.0057	12.0875	15.3478	17.9132	19.0961 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581 (71)
Water heating gains (Table 5)	115.0562	112.9981	108.7242	102.9139	99.1416	93.8300	89.3153	95.0999	97.1551	103.1690	109.9597	113.0067 (72)
Total internal gains	397.9816	395.9596	383.2780	362.8690	342.2188	322.2725	309.2875	315.0360	325.4989	346.1114	369.7800	387.4618 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
North					5.8800	10.6334	0.6300	0.7000			0.7700	19.1083 (74)
Northwest					7.0700	11.2829	0.6300	0.7000			0.7700	24.3789 (81)
Solar gains	43.4871	86.1407	151.4575	246.5010	331.6343	354.1512	331.0351	263.3898	183.5487	104.1129	54.2474	35.8386 (83)
Total gains	441.4687	482.1003	534.7355	609.3700	673.8531	676.4237	640.3226	578.4258	509.0476	450.2243	424.0274	423.3004 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	70.0405	70.2700	70.4965	71.5799	71.7863	72.7631	72.7631	72.9469	72.3837	71.7863	71.3700	70.9398
alpha	5.6694	5.6847	5.6998	5.7720	5.7858	5.8509	5.8509	5.8631	5.8256	5.7858	5.7580	5.7293
util living area	0.9979	0.9960	0.9889	0.9546	0.8401	0.6366	0.4739	0.5433	0.8289	0.9760	0.9955	0.9983 (86)
MIT	19.9842	20.0989	20.3206	20.6363	20.8817	20.9815	20.9972	20.9941	20.9201	20.6092	20.2504	19.9687 (87)
Th 2	20.0904	20.0931	20.0958	20.1083	20.1106	20.1215	20.1215	20.1235	20.1173	20.1106	20.1059	20.1009 (88)
util rest of house	0.9972	0.9946	0.9850	0.9386	0.7923	0.5579	0.3811	0.4438	0.7608	0.9646	0.9938	0.9978 (89)
MIT 2	18.7297	18.8990	19.2229	19.6797	19.9969	20.1095	20.1205	20.1211	20.0530	19.6507	19.1302	18.7150 (90)
Living area fraction									fLA = Living area / (4) =			0.3846 (91)
MIT	19.2122	19.3605	19.6451	20.0476	20.3372	20.4449	20.4577	20.4569	20.3865	20.0194	19.5611	19.1972 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2122	19.3605	19.6451	20.0476	20.3372	20.4449	20.4577	20.4569	20.3865	20.0194	19.5611	19.1972 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9962	0.9932	0.9825	0.9374	0.8055	0.5876	0.4169	0.4822	0.7835	0.9632	0.9923	0.9970 (94)
Useful gains	439.7965	478.8098	525.3686	571.2020	542.7729	397.4964	266.9643	278.9298	398.8394	433.6394	420.7646	422.0274 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1075.9275	1039.9304	942.2962	787.0130	608.0255	405.9340	267.9188	281.0432	438.8945	663.0880	882.3280	1068.3425 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	473.2814	377.0731	310.1941	155.3839	48.5479	0.0000	0.0000	0.0000	0.0000	170.7098	332.3257	480.8585 (98)
Space heating												2348.3743 (98)
Space heating per m2										(98) / (4) =		32.2712 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2511.6303 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	473.2814	377.0731	310.1941	155.3839	48.5479	0.0000	0.0000	0.0000	0.0000	170.7098	332.3257	480.8585	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	506.1833	403.2867	331.7584	166.1860	51.9229	0.0000	0.0000	0.0000	0.0000	182.5773	355.4285	514.2871	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500	(64)
Efficiency of water heater (217)m	87.1292	86.8913	86.2851	84.7451	82.1002	79.8000	79.8000	79.8000	79.8000	84.8991	86.5034	79.8000	(216)
Fuel for water heating, kWh/month	220.2890	194.7283	206.0233	188.1540	190.4082	175.1642	168.3438	184.5636	184.1870	194.7454	201.9670	214.7992	(219)
Water heating fuel used												2323.3731	(219)
Annual totals kWh/year													
Space heating fuel - main system												2511.6303	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												328.1242	(232)
Total delivered energy for all uses												5238.1276	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2511.6303	0.2160	542.5121 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2323.3731	0.2160	501.8486 (264)
Space and water heating			1044.3607 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	328.1242	0.5190	170.2965 (268)
Total CO2, kg/m2/year			1253.5822 (272)
Emissions per m2 for space and water heating			14.3515 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3402 (272b)
Emissions per m2 for pumps and fans			0.5349 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.3515 * 1.55) + 2.3402 + 0.5349, rounded to 2 d.p.			25.1200 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010554				Issued on Date	29/04/2022
Assessment Reference	120		Prop Type Ref			
Property						
SAP Rating	84 B	DER	11.55	TER	23.08	
Environmental	92 A	% DER<TER	49.97			
CO ₂ Emissions (t/year)	0.68	DFEE	33.90	TFEE	39.71	
General Requirements Compliance	Fail	% DFEE<TFEE	14.62			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 74 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 23.08 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 11.55 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)39.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)33.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading: Average
Windows facing North: 1.97 m², No overhang
Windows facing North East: 6.47 m², No overhang
Windows facing East: 2.21 m², No overhang
Windows facing South East: 6.24 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 454.01 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

					main heating	+	secondary heating	+	other	=	total	m3 per hour
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =										0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50											3.0000	
Infiltration rate											0.1500	(18)
Number of sides sheltered											2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =										0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =										0.1275	(21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			16.8900	1.1450	19.3397		(27)					
External Wall	49.6500	16.8900	32.7600	0.1500	4.9140		(29a)					
Corridor	4.5800	1.8900	2.6900	0.2500	0.6725		(29a)					
Total net area of external elements Aum(A, m2)			54.2300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	26.8162		(33)					
Party Wall 1			38.0500	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.6120 (36)					
Total fabric heat loss							(33) + (36) = 35.4282 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 17.2447	Feb 17.0514	Mar 16.8580	Apr 15.8913	May 15.6980	Jun 14.7313	Jul 14.7313	Aug 14.5380	Sep 15.1180	Oct 15.6980	Nov 16.0847	Dec 16.4714 (38)
Heat transfer coeff	52.6729	52.4796	52.2862	51.3195	51.1262	50.1595	50.1595	49.9662	50.5462	51.1262	51.5129	51.8995 (39)
Average = Sum(39)m / 12 =												51.2712 (39)
HLP	Jan 0.7164	Feb 0.7138	Mar 0.7112	Apr 0.6980	May 0.6954	Jun 0.6823	Jul 0.6823	Aug 0.6796	Sep 0.6875	Oct 0.6954	Nov 0.7007	Dec 0.7059 (40)
HLP (average)												0.6974 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	Jan 98.4511	Feb 94.8710	Mar 91.2910	Apr 87.7110	May 84.1309	Jun 80.5509	Jul 80.5509	Aug 84.1309	Sep 87.7110	Oct 91.2910	Nov 94.8710	Dec 98.4511 (44)
Energy conte	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Energy content (annual)												Total = Sum(45)m = 1408.1991 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												

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Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (56)													
If cylinder contains dedicated solar storage													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (57)													
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month													
201.2769 177.6201 187.0442 168.3717 165.5050 148.6122 143.4181 156.4202 155.8451 174.5575 183.6979 196.6701 196.6701 (62)													
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
201.2769 177.6201 187.0442 168.3717 165.5050 148.6122 143.4181 156.4202 155.8451 174.5575 183.6979 196.6701 196.6701 (64)													
Total per year (kWh/year) = Sum(64)m =													2059.0388 (64)
Heat gains from water heating, kWh/month													
92.7665 82.3997 88.0341 80.9919 80.8723 74.4219 73.5284 77.8516 76.8268 83.8823 86.0878 91.2347 91.2347 (65)													

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)													
(66)m 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 (66)													
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
18.3088 16.2617 13.2249 10.0121 7.4842 6.3185 6.8273 8.8744 11.9112 15.1240 17.6520 18.8177 18.8177 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
205.3693 207.5004 202.1301 190.6974 176.2657 162.7019 153.6405 151.5094 156.8797 168.3123 182.7441 196.3078 196.3078 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 (69)													
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													
-93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 (71)													
Water heating gains (Table 5)													
124.6861 122.6187 118.3254 112.4887 108.6993 103.3637 98.8285 104.6393 106.7039 112.7450 119.5664 122.6273 122.6273 (72)													
Total internal gains													
406.2912 404.3077 391.6074 371.1252 350.3761 330.3110 317.2233 322.9500 333.4217 354.1083 377.8894 395.6798 395.6798 (73)													

6. Solar gains

[Jan]													
Area m2													
Solar flux Table 6a W/m2													
Specific data or Table 6b													
Specific data or Table 6c													
Access factor Table 6d													
Gains W													
North 1.9700 10.6334 0.4000 0.8000 0.7700 4.6454 (74)													
Northeast 6.4700 11.2829 0.4000 0.8000 0.7700 16.1886 (75)													
East 2.2100 19.6403 0.4000 0.8000 0.7700 9.6255 (76)													
Southeast 6.2400 36.7938 0.4000 0.8000 0.7700 50.9147 (77)													
Solar gains	81.3741	147.3860	224.1274	313.9875	383.8134	394.9010	374.9771	320.9403	255.0324	169.0321	99.0860	68.5809	68.5809 (83)
Total gains	487.6653	551.6937	615.7347	685.1127	734.1896	725.2120	692.2003	643.8903	588.4541	523.1404	476.9754	464.2607	464.2607 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)													
tau 96.9295 97.2866 97.6463 99.4856 99.8618 101.7863 101.7863 102.1802 101.0077 99.8618 99.1122 98.3738 98.3738 (86)													
alpha 7.4620 7.4858 7.5098 7.6324 7.6575 7.7858 7.7858 7.8120 7.7338 7.6575 7.6075 7.5583 7.5583 (86)													
util living area 0.9945 0.9853 0.9525 0.8363 0.6392 0.4422 0.3188 0.3569 0.5884 0.8915 0.9843 0.9960 0.9960 (86)													
MIT 20.4526 20.5819 20.7617 20.9332 20.9914 20.9996 21.0000 20.9999 20.9965 20.9090 20.6570 20.4308 20.4308 (87)													
Th 2 20.3263 20.3286 20.3310 20.3426 20.3449 20.3565 20.3565 20.3589 20.3519 20.3449 20.3402 20.3356 20.3356 (88)													
util rest of house 0.9929 0.9812 0.9404 0.8058 0.5970 0.3980 0.2722 0.3072 0.5350 0.8618 0.9793 0.9948 0.9948 (89)													
MIT 2 19.5951 19.7833 20.0379 20.2709 20.3374 20.3563 20.3565 20.3588 20.3494 20.2482 19.9022 19.5711 19.5711 (90)													
Living area fraction fLA = Living area / (4) = 0.3678 (91)													
MIT 19.9105 20.0770 20.3041 20.5145 20.5780 20.5929 20.5932 20.5946 20.5874 20.4913 20.1798 19.8873 19.8873 (92)													
Temperature adjustment 0.0000													
adjusted MIT 19.9105 20.0770 20.3041 20.5145 20.5780 20.5929 20.5932 20.5946 20.5874 20.4913 20.1798 19.8873 19.8873 (93)													

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.9916 0.9794 0.9399 0.8141 0.6122 0.4142 0.2893 0.3255 0.5545 0.8689 0.9778 0.9938 0.9938 (94)													
Useful gains	483.5925	540.3385	578.7309	557.7796	449.4678	300.4138	200.2868	209.5675	326.3272	454.5820	466.3702	461.3785	461.3785 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	4.2000 (96)
Heat loss rate W													
822.2507 796.4811 721.7657 596.0497 453.8968 300.5991 200.2959 209.5895 327.9140 505.7030 673.7790 814.1629 814.1629 (97)													
Month fracti 1.0000 1.0000 1.0000 1.0000 1.0000 0.0000 0.0000 0.0000 0.0000 1.0000 1.0000 1.0000 1.0000 (97a)													
Space heating kWh													
251.9617 172.1278 106.4179 27.5545 3.2951 0.0000 0.0000 0.0000 0.0000 38.0340 149.3344 262.4716 262.4716 (98)													
Space heating													
Space heating per m2													
													1011.1969 (98)
													(98) / (4) = 13.7540 (99)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1011.1969 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1133.5518 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	59.6606 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2059.0388 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2308.1825 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	121.4833 (310b)
Electricity used for heat distribution	36.2288 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	170.9800 (330a)
Total electricity for the above, kWh/year	170.9800 (331)
Electricity for lighting (calculated in Appendix L)	323.3395 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	4117.1977 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1376.6937	0.5190	714.5040 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	182.9736	0.5190	94.9633 (368)
Electrical energy for heat distribution	36.2288	0.5190	18.8027 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			828.2701 (373)
Space and water heating			828.2701 (376)
Pumps and fans	170.9800	0.5190	88.7386 (378)
Energy for lighting	323.3395	0.5190	167.8132 (379)
Energy saving/generation technologies			
PV Unit	-454.0100	0.5190	-235.6312 (380)
Total CO2, kg/year			849.1907 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			11.5500 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		11.5500 ZC1
Total Floor Area	TFA	73.5200
Assumed number of occupants	N	2.3285
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.5530 ZC2
CO2 emissions from cooking, equation (L16)		2.3787 ZC3
Total CO2 emissions		30.4817 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		30.4817 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.1632 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4132 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3512 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4478	0.4390	0.4303	0.3864	0.3776	0.3337	0.3337	0.3249	0.3512	0.3776	0.3951	0.4127 (22b)
Effective ac	0.6003	0.5964	0.5926	0.5746	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			16.4900	1.3258	21.8617		(27)					
External Wall	49.6500	16.4900	33.1600	0.1800	5.9688		(29a)					
Corridor	4.5800	1.8900	2.6900	0.1800	0.4842		(29a)					
Total net area of external elements Aum(A, m2)			54.2300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.2047		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.5566 (36)					
Total fabric heat loss						(33) + (36) =	36.7613 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 36.4091	Feb 36.1729	Mar 35.9414	Apr 34.8541	May 34.6506	Jun 33.7036	Jul 33.7036	Aug 33.5282	Sep 34.0684	Oct 34.6506	Nov 35.0622	Dec 35.4924 (38)
Heat transfer coeff	73.1704	72.9342	72.7028	71.6154	71.4120	70.4649	70.4649	70.2896	70.8297	71.4120	71.8235	72.2538 (39)
Average = Sum(39)m / 12 =												71.6144 (39)
HLP	Jan 0.9952	Feb 0.9920	Mar 0.9889	Apr 0.9741	May 0.9713	Jun 0.9584	Jul 0.9584	Aug 0.9561	Sep 0.9634	Oct 0.9713	Nov 0.9769	Dec 0.9828 (40)
HLP (average)												0.9741 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy conte	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Energy content (annual)										Total = Sum(45)m =		1408.1991 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

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If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
	85.8210	76.1264	81.0886	74.2704	73.9268	67.7004	66.5829	70.9061	70.1053	76.9367	79.3664	84.2892 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3070	16.2601	13.2236	10.0111	7.4834	6.3178	6.8266	8.8735	11.9100	15.1225	17.6502	18.8158	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	(71)
Water heating gains (Table 5)	115.3508	113.2833	108.9900	103.1533	99.3640	94.0283	89.4931	95.3039	97.3685	103.4096	110.2311	113.2919	(72)
Total internal gains	399.9539	397.9707	385.2706	364.7888	344.0400	323.9750	310.8872	316.6137	327.0851	347.7714	371.5522	389.3425	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g	Specific data or Table 6b	FF	Specific data or Table 6c	Access factor Table 6d	Gains W	
North				1.9200	10.6334		0.6300		0.7000	0.7700	6.2394 (74)	
Northeast				6.3200	11.2829		0.6300		0.7000	0.7700	21.7927 (75)	
East				2.1600	19.6403		0.6300		0.7000	0.7700	12.9650 (76)	
Southeast				6.0900	36.7938		0.6300		0.7000	0.7700	68.4801 (77)	
Solar gains	109.4772	198.2928	301.5531	422.4704	516.4299	531.3511	504.5419	431.8290	343.1398	227.4190	133.3072	92.2650 (83)
Total gains	509.4312	596.2635	686.8237	787.2591	860.4699	855.3261	815.4291	748.4428	670.2249	575.1904	504.8594	481.6075 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.7762	70.0022	70.2251	71.2913	71.4944	72.4553	72.4553	72.6360	72.0821	71.4944	71.0847	70.6614	
alpha	5.6517	5.6668	5.6817	5.7528	5.7663	5.8304	5.8304	5.8424	5.8055	5.7663	5.7390	5.7108	
util living area	0.9958	0.9893	0.9676	0.8895	0.7240	0.5212	0.3794	0.4302	0.6935	0.9372	0.9900	0.9969	(86)
MIT	20.0606	20.2314	20.4872	20.7806	20.9456	20.9932	20.9991	20.9982	20.9683	20.7311	20.3424	20.0333	(87)
Th 2	20.0873	20.0900	20.0926	20.1050	20.1073	20.1181	20.1181	20.1201	20.1139	20.1073	20.1026	20.0977	(88)
util rest of house	0.9945	0.9860	0.9577	0.8599	0.6687	0.4521	0.3038	0.3489	0.6181	0.9129	0.9863	0.9959	(89)
MIT 2	18.8387	19.0883	19.4556	19.8625	20.0590	20.1139	20.1178	20.1194	20.0913	19.8098	19.2604	18.8067	(90)
Living area fraction	19.2881	19.5087	19.8351	20.2001	20.3851	20.4373	20.4419	20.4426	20.4138	20.1487	19.6584	19.2578	(91)
MIT	19.2881	19.5087	19.8351	20.2001	20.3851	20.4373	20.4419	20.4426	20.4138	20.1487	19.6584	19.2578	(92)
Temperature adjustment	19.2881	19.5087	19.8351	20.2001	20.3851	20.4373	20.4419	20.4426	20.4138	20.1487	19.6584	19.2578	(93)
adjusted MIT	19.2881	19.5087	19.8351	20.2001	20.3851	20.4373	20.4419	20.4426	20.4138	20.1487	19.6584	19.2578	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9929	0.9832	0.9543	0.8634	0.6866	0.4774	0.3316	0.3788	0.6446	0.9142	0.9839	0.9947	(94)
Ext temp.	505.8298	586.2685	655.4357	679.7154	590.7937	408.3150	270.4286	283.5377	432.0324	525.8519	496.7444	479.0404	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1096.6878	1065.4774	969.4949	809.2647	620.2208	411.3255	270.7207	284.1534	447.2074	681.8883	901.9874	1087.9829	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	439.5984	322.0284	233.6600	93.2755	21.8938	0.0000	0.0000	0.0000	0.0000	116.0911	291.7749	453.0532	(98)
Space heating per m2												1971.3753	(98)
												26.8141	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2108.4228 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	439.5984	322.0284	233.6600	93.2755	21.8938	0.0000	0.0000	0.0000	0.0000	116.0911	291.7749	453.0532	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	470.1587	344.4154	249.9038	99.7599	23.4158	0.0000	0.0000	0.0000	0.0000	124.1616	312.0588	484.5489	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882	(64)
Efficiency of water heater (217)m	86.9483	86.4963	85.5351	83.4333	80.9728	79.8000	79.8000	79.8000	79.8000	83.8833	86.1639	87.0761	(216)
Fuel for water heating, kWh/month	221.5052	196.2840	208.5252	191.7338	193.6737	175.7022	168.8423	185.1357	184.7660	197.7456	203.4448	215.8896	(219)
Water heating fuel used												2343.2482	(219)
Annual totals kWh/year													
Space heating fuel - main system												2108.4228	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												323.3067	(232)
Total delivered energy for all uses												4849.9778	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2108.4228	0.2160	455.4193 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2343.2482	0.2160	506.1416 (264)
Space and water heating			961.5609 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	323.3067	0.5190	167.7962 (268)
Total CO2, kg/m2/year			1168.2821 (272)
Emissions per m2 for space and water heating			13.0789 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.2823 (272b)
Emissions per m2 for pumps and fans			0.5294 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.0789 * 1.55) + 2.2823 + 0.5294, rounded to 2 d.p.			23.0800 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010555				Issued on Date	29/04/2022
Assessment Reference	121	Prop Type Ref				
Property						
SAP Rating	84 B	DER	10.88	TER	23.69	
Environmental	93 A	% DER<TER	54.08			
CO ₂ Emissions (t/year)	0.47	DFEE	28.59	TFEE	30.75	
General Requirements Compliance	Fail	% DFEE<TFEE	7.05			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aecom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 23.69 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 10.88 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)30.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)28.6 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing South East:	6.24 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	454.01 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							3	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.7750 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1163 (21)				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)					
External Wall	19.8500	8.4500	11.4000	0.1500	1.7100		(29a)					
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)					
Total net area of external elements Aum(A, m2)				37.3500			(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	17.1781		(33)					
Party Wall 1				37.0000	0.0000	0.0000	(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.3010 (36)					
Total fabric heat loss							(33) + (36) = 22.4791 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 11.1341	Feb 11.0123	Mar 10.8905	Apr 10.2816	May 10.1599	Jun 9.5510	Jul 9.5510	Aug 9.4292	Sep 9.7945	Oct 10.1599	Nov 10.4034	Dec 10.6470 (38)
Heat transfer coeff	33.6132	33.4914	33.3696	32.7607	32.6389	32.0301	32.0301	31.9083	32.2736	32.6389	32.8825	33.1260 (39)
Average = Sum(39)m / 12 =	32.7303 (39)											
HLP	Jan 0.6618	Feb 0.6594	Mar 0.6570	Apr 0.6450	May 0.6426	Jun 0.6306	Jul 0.6306	Aug 0.6282	Sep 0.6354	Oct 0.6426	Nov 0.6474	Dec 0.6522 (40)
HLP (average)	0.6444 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan 82.3820	Feb 79.3863	Mar 76.3906	Apr 73.3949	May 70.3992	Jun 67.4035	Jul 67.4035	Aug 70.3992	Sep 73.3949	Oct 76.3906	Nov 79.3863	Dec 82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (56)													
If cylinder contains dedicated solar storage													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (57)													
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month													
177.4469 156.7782 165.5372 149.6214 147.5136 133.0871 129.0318 139.9117 139.1394 155.0886 162.4461 173.5921 (62)													
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
177.4469 156.7782 165.5372 149.6214 147.5136 133.0871 129.0318 139.9117 139.1394 155.0886 162.4461 173.5921 (64)													
Total per year (kWh/year) = Sum(64)m =													1829.1942 (64)
Heat gains from water heating, kWh/month													
84.8430 75.4698 80.8830 74.7574 74.8902 69.2597 68.7450 72.3625 71.2721 77.4089 79.0216 83.5613 (65)													

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
13.4839 11.9763 9.7398 7.3736 5.5119 4.6534 5.0281 6.5357 8.7723 11.1384 13.0002 13.8587 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
149.2855 150.8347 146.9309 138.6204 128.1298 118.2701 111.6832 110.1341 114.0378 122.3484 132.8390 142.6987 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 (69)													
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													
-68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 (71)													
Water heating gains (Table 5)													
114.0363 112.3063 108.7138 103.8297 100.6589 96.1941 92.3992 97.2615 98.9891 104.0442 109.7522 112.3135 (72)													
Total internal gains	325.5065	323.8179	314.0852	298.5244	283.0012	267.8182	257.8112	262.6320	270.4999	286.2317	304.2921	317.5716	317.5716 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W	
Southeast					6.2400	36.7938	0.4000		0.8000			0.7700			50.9147 (77)
South					2.2100	46.7521	0.4000		0.8000			0.7700			22.9127 (78)

Solar gains	73.8274	124.2516	166.4633	201.0539	220.9821	217.6723	210.5612	195.8614	178.4200	136.3256	88.1434			63.3710 (83)	
Total gains	399.3338	448.0695	480.5485	499.5783	503.9832	485.4906	468.3724	458.4934	448.9198	422.5573	392.4355			380.9426 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
tau	104.9316	105.3132	105.6975	107.6620	108.0637	110.1179	110.1179	110.5382	109.2869	108.0637	107.2633	106.4746	106.4746 (86)
alpha	7.9954	8.0209	8.0465	8.1775	8.2042	8.3412	8.3412	8.3692	8.2858	8.2042	8.1509	8.0983	8.0983 (87)
util living area	0.9801	0.9528	0.8925	0.7654	0.5985	0.4221	0.3009	0.3201	0.4953	0.7731	0.9457	0.9849	0.9849 (88)
MIT	20.6551	20.7720	20.8883	20.9714	20.9961	20.9998	21.0000	21.0000	20.9993	20.9740	20.8251	20.6313	20.6313 (89)
Th 2	20.3747	20.3768	20.3790	20.3896	20.3918	20.4025	20.4025	20.4047	20.3982	20.3918	20.3875	20.3832	20.3832 (90)
util rest of house	0.9751	0.9424	0.8724	0.7336	0.5607	0.3827	0.2600	0.2787	0.4524	0.7361	0.9322	0.9810	0.9810 (91)
MIT 2	19.9260	20.0911	20.2483	20.3601	20.3885	20.4024	20.4025	20.4046	20.3977	20.3663	20.1755	19.8996	19.8996 (92)
Living area fraction									fLA = Living area / (4) =				
MIT	20.2926	20.4335	20.5701	20.6675	20.6940	20.7028	20.7030	20.7040	20.7002	20.6719	20.5022	20.2675	20.2675 (93)
Temperature adjustment													0.0000
adjusted MIT	20.2926	20.4335	20.5701	20.6675	20.6940	20.7028	20.7030	20.7040	20.7002	20.6719	20.5022	20.2675	20.2675 (94)

8. Space heating requirement

Utilisation	0.9744	0.9434	0.8789	0.7484	0.5796	0.4025	0.2806	0.2995	0.4740	0.7535	0.9349	0.9801	0.9801 (94)
Useful gains	389.0916	422.7160	422.3306	373.8624	292.0911	195.4142	131.4154	137.3297	212.7811	318.4072	366.9047	373.3658	373.3658 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	4.2000 (96)
Heat loss rate W	537.5630	520.2378	469.5140	385.5124	293.5554	195.4733	131.4178	137.3337	213.0138	328.7359	440.6970	532.2525	532.2525 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	110.4627	65.5347	35.1045	8.3880	1.0895	0.0000	0.0000	0.0000	0.0000	7.6845	53.1304	118.2117	118.2117 (98)
Space heating													399.6060 (98)
Space heating per m2													(98) / (4) = 7.8678 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	399.6060 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	447.9583 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	23.5768 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2050.5266 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	107.9225 (310b)
Electricity used for heat distribution	26.2998 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	238.1302 (332)
Energy saving/generation technologies (Appendices M, N and Q)	
Total delivered energy for all uses	2990.1056 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	999.3940	0.5190	518.6855 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	132.8275	0.5190	68.9375 (368)
Electrical energy for heat distribution	26.2998	0.5190	13.6496 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			601.2726 (373)
Space and water heating			601.2726 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	238.1302	0.5190	123.5896 (379)
Energy saving/generation technologies			
PV Unit	-454.0100	0.5190	-235.6312 (380)
Total CO2, kg/year			552.5444 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			10.8800 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		10.8800 ZC1
Total Floor Area	TFA	50.7900
Assumed number of occupants	N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.4175 ZC2
CO2 emissions from cooking, equation (L16)		3.1526 ZC3
Total CO2 emissions		31.4501 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		31.4501 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 20.0000 / (5) = 0.1575 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4075 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
Effective ac	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)					
External Wall	19.8500	8.4500	11.4000	0.1800	2.0520		(29a)					
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)					
Total net area of external elements Aum(A, m2)			37.3500				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =			17.9545	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.9726 (36)					
Total fabric heat loss						(33) + (36) =	21.9271 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 24.3480	Feb 24.2160	Mar 24.0867	Apr 23.4794	May 23.3658	Jun 22.8368	Jul 22.8368	Aug 22.7389	Sep 23.0406	Oct 23.3658	Nov 23.5957	Dec 23.8360 (38)
Heat transfer coeff	46.2750	46.1431	46.0138	45.4065	45.2928	44.7639	44.7639	44.6659	44.9676	45.2928	45.5227	45.7630 (39)
Average = Sum(39)m / 12 =												45.4059 (39)
HLP	Jan 0.9111	Feb 0.9085	Mar 0.9060	Apr 0.8940	May 0.8918	Jun 0.8814	Jul 0.8814	Aug 0.8794	Sep 0.8854	Oct 0.8918	Nov 0.8963	Dec 0.9010 (40)
HLP (average)												0.8940 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Southeast				6.2400	36.7938	0.6300	0.7000	0.7700	70.1668 (77)			
South				2.2100	46.7521	0.6300	0.7000	0.7700	31.5766 (78)			
Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains	421.2115	488.9806	537.3716	569.4289	581.3281	561.5651	541.7662	526.3621	510.2428	468.0154	419.7157	398.8747 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	76.2201	76.4380	76.6527	77.6780	77.8729	78.7931	78.7931	78.9659	78.4360	77.8729	77.4796	77.0728	
alpha	6.0813	6.0959	6.1102	6.1785	6.1915	6.2529	6.2529	6.2644	6.2291	6.1915	6.1653	6.1382	
util living area	0.9885	0.9719	0.9340	0.8448	0.6945	0.5064	0.3631	0.3897	0.5970	0.8637	0.9717	0.9913	(86)
MIT	20.3109	20.4822	20.6801	20.8674	20.9660	20.9959	20.9996	20.9993	20.9890	20.8704	20.5639	20.2768	(87)
Th 2	20.1581	20.1603	20.1624	20.1726	20.1745	20.1834	20.1834	20.1850	20.1800	20.1745	20.1707	20.1666	(88)
util rest of house	0.9851	0.9642	0.9172	0.8109	0.6422	0.4435	0.2960	0.3210	0.5307	0.8261	0.9627	0.9888	(89)
MIT 2	19.2552	19.5011	19.7776	20.0303	20.1446	20.1809	20.1832	20.1848	20.1725	20.0408	19.6284	19.2126	(90)
Living area fraction	19.7861	19.9945	20.2314	20.4513	20.5577	20.5907	20.5937	20.5944	20.5831	20.4580	20.0989	19.7477	(92)
Temperature adjustment	19.7861	19.9945	20.2314	20.4513	20.5577	20.5907	20.5937	20.5944	20.5831	20.4580	20.0989	19.7477	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	414.1915	470.6274	493.6920	468.6178	387.7457	266.7830	178.6577	187.1586	287.6369	393.0783	403.6675	393.7705	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	716.6180	696.5067	631.8341	524.5023	401.1892	268.1678	178.7745	187.3454	291.5290	446.4946	591.7431	711.5114	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	225.0053	151.7909	102.7777	40.2368	10.0020	0.0000	0.0000	0.0000	0.0000	39.7417	135.4144	236.3992	(98)
Space heating												941.3681	(98)
Space heating per m2												18.5345	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1006.8108 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	225.0053	151.7909	102.7777	40.2368	10.0020	0.0000	0.0000	0.0000	0.0000	39.7417	135.4144	236.3992	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	240.6474	162.3432	109.9227	43.0340	10.6973	0.0000	0.0000	0.0000	0.0000	42.5045	144.8282	252.8334	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	85.5818	84.8645	83.7183	81.9485	80.4391	79.8000	79.8000	79.8000	79.8000	81.8665	84.4723	85.7739	(216)
Fuel for water heating, kWh/month	197.1972	175.4993	187.3609	172.3273	172.5923	156.2471	150.8144	164.4484	163.8315	178.8360	182.3607	192.2615	(219)
Water heating fuel used												2093.7767	(219)
Annual totals kWh/year													
Space heating fuel - main system												1006.8108	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												3418.9638	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1006.8108	0.2160	217.4711 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2093.7767	0.2160	452.2558 (264)
Space and water heating			669.7269 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			834.9642 (272)
Emissions per m2 for space and water heating			13.1862 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.1862 * 1.55) + 2.4870 + 0.7664, rounded to 2 d.p.			23.6900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010556			Issued on Date	29/04/2022
Assessment Reference	122	Prop Type Ref			
Property					
SAP Rating	84 B	DER	11.06	TER	24.00
Environmental	93 A	% DER<TER	53.91		
CO ₂ Emissions (t/year)	0.48	DFEE	29.45	TFEE	31.81
General Requirements Compliance	Fail	% DFEE<TFEE	7.41		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 24.00 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 11.06 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)31.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)29.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing South East:	6.24 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	454.01 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

					main heating	+	secondary heating	+	other	=	total	m3 per hour
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =										0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50											3.0000	
Infiltration rate											0.1500	(18)
Number of sides sheltered											3	(19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1163 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)					
External Wall	23.1000	8.4500	14.6500	0.1500	2.1975		(29a)					
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)					
Total net area of external elements Aum(A, m2)				40.6000			(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	17.6656		(33)					
Party Wall 1			33.8800	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.5610 (36)					
Total fabric heat loss							(33) + (36) = 23.2266 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 11.1341	Feb 11.0123	Mar 10.8905	Apr 10.2816	May 10.1599	Jun 9.5510	Jul 9.5510	Aug 9.4292	Sep 9.7945	Oct 10.1599	Nov 10.4034	Dec 10.6470 (38)
Heat transfer coeff	34.3607	34.2389	34.1171	33.5082	33.3864	32.7776	32.7776	32.6558	33.0211	33.3864	33.6300	33.8735 (39)
Average = Sum(39)m / 12 =	33.4778 (39)											
HLP	Jan 0.6765	Feb 0.6741	Mar 0.6717	Apr 0.6597	May 0.6573	Jun 0.6454	Jul 0.6454	Aug 0.6430	Sep 0.6501	Oct 0.6573	Nov 0.6621	Dec 0.6669 (40)
HLP (average)	0.6591 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan 82.3820	Feb 79.3863	Mar 76.3906	Apr 73.3949	May 70.3992	Jun 67.4035	Jul 67.4035	Aug 70.3992	Sep 73.3949	Oct 76.3906	Nov 79.3863	Dec 82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												

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Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (56)													
If cylinder contains dedicated solar storage													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (57)													
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month													
177.4469 156.7782 165.5372 149.6214 147.5136 133.0871 129.0318 139.9117 139.1394 155.0886 162.4461 173.5921 173.5921 (62)													
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
177.4469 156.7782 165.5372 149.6214 147.5136 133.0871 129.0318 139.9117 139.1394 155.0886 162.4461 173.5921 173.5921 (64)													
Total per year (kWh/year) = Sum(64)m =													1829.1942 (64)
Heat gains from water heating, kWh/month													
84.8430 75.4698 80.8830 74.7574 74.8902 69.2597 68.7450 72.3625 71.2721 77.4089 79.0216 83.5613 83.5613 (65)													

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
13.4839 11.9763 9.7398 7.3736 5.5119 4.6534 5.0281 6.5357 8.7723 11.1384 13.0002 13.8587 13.8587 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
149.2855 150.8347 146.9309 138.6204 128.1298 118.2701 111.6832 110.1341 114.0378 122.3484 132.8390 142.6987 142.6987 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 31.5669 (69)													
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													
-68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 -68.5351 (71)													
Water heating gains (Table 5)													
114.0363 112.3063 108.7138 103.8297 100.6589 96.1941 92.3992 97.2615 98.9891 104.0442 109.7522 112.3135 112.3135 (72)													
Total internal gains													
325.5065 323.8179 314.0852 298.5244 283.0012 267.8182 257.8112 262.6320 270.4999 286.2317 304.2921 317.5716 317.5716 (73)													

6. Solar gains

[Jan]													
Area	m2												
Solar flux	Table 6a												
Specific data	g												
Specific data	or Table 6b												
FF	Specific data												
Access	factor												
Table 6d													
Gains	W												
Southeast	6.2400												50.9147 (77)
South	2.2100												22.9127 (78)
Solar gains	73.8274	124.2516	166.4633	201.0539	220.9821	217.6723	210.5612	195.8614	178.4200	136.3256	88.1434	63.3710	63.3710 (83)
Total gains	399.3338	448.0695	480.5485	499.5783	503.9832	485.4906	468.3724	458.4934	448.9198	422.5573	392.4355	380.9426	380.9426 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec													
tau	102.6489	103.0140	103.3817	105.2603	105.6442	107.6067	107.6067	108.0079	106.8130	105.6442	104.8791	104.1250	104.1250
alpha	7.8433	7.8676	7.8921	8.0174	8.0429	8.1738	8.1738	8.2005	8.1209	8.0429	7.9919	7.9417	7.9417
util living area													
0.9815 0.9564 0.9000 0.7778 0.6112 0.4318 0.3079 0.3276 0.5065 0.7854 0.9500 0.9860 0.9860 (86)													
MIT	20.6320	20.7516	20.8740	20.9657	20.9950	20.9997	21.0000	21.0000	20.9991	20.9688	20.8079	20.6077	20.6077 (87)
Th 2	20.3616	20.3637	20.3659	20.3765	20.3787	20.3894	20.3894	20.3915	20.3851	20.3787	20.3744	20.3701	20.3701 (88)
util rest of house													
0.9768 0.9465 0.8804 0.7457 0.5721 0.3908 0.2652 0.2843 0.4618 0.7482 0.9371 0.9823 0.9823 (89)													
MIT 2	19.8820	20.0513	20.2176	20.3409	20.3744	20.3892	20.3893	20.3915	20.3844	20.3480	20.1406	19.8548	19.8548 (90)
Living area fraction													
fLA = Living area / (4) =													
MIT	20.2592	20.4034	20.5477	20.6551	20.6865	20.6962	20.6964	20.6975	20.6935	20.6601	20.4761	20.2334	20.2334 (92)
Temperature adjustment													
adjusted MIT	20.2592	20.4034	20.5477	20.6551	20.6865	20.6962	20.6964	20.6975	20.6935	20.6601	20.4761	20.2334	20.2334 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.9760 0.9471 0.8864 0.7603 0.5916 0.4114 0.2867 0.3061 0.4843 0.7654 0.9394 0.9814 0.9814 (94)													
Useful gains	389.7316	424.3886	425.9349	379.8513	298.1356	199.7359	134.2668	140.3312	217.4101	323.4429	368.6451	373.8417	373.8417 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	4.2000 (96)
Heat loss rate W													
548.3668 530.8195 479.2663 393.8908 300.0260 199.8189 134.2703 140.3372 217.7251 335.8724 449.8393 543.1081 543.1081 (97)													
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh													
118.0246 71.5216 39.6786 10.1084 1.4065 0.0000 0.0000 0.0000 0.0000 9.2475 58.4598 125.9343 125.9343 (98)													
Space heating													
Space heating per m2													
(98) / (4) =													8.5525 (99)

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8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	434.3813 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	486.9415 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	25.6285 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2050.5266 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	107.9225 (310b)
Electricity used for heat distribution	26.7102 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	238.1302 (332)
Energy saving/generation technologies (Appendices M, N and Q)	
Total delivered energy for all uses	3031.1405 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year	
Efficiency of heat source Heat pump			250.0000 (367a)	
Space heating from Heat pump	1014.9872	0.5190	526.7784 (367)	
Efficiency of heat source Boilers			99.0000 (367b)	
Space heating from Boilers	134.9000	0.5190	70.0131 (368)	
Electrical energy for heat distribution	26.7102	0.5190	13.8626 (372)	
Total CO ₂ associated with community systems (negative value allowed since DFEE <= TFEE)			610.6540 (373)	
Space and water heating			610.6540 (376)	
Pumps and fans	121.9912	0.5190	63.3134 (378)	
Energy for lighting	238.1302	0.5190	123.5896 (379)	
Energy saving/generation technologies				
PV Unit	-454.0100	0.5190	-235.6312 (380)	
Total CO ₂ , kg/year			561.9259 (383)	
Dwelling Carbon Dioxide Emission Rate (DER)			11.0600 (384)	

16 CO₂ EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			11.0600 ZC1
Total Floor Area		TFA	50.7900
Assumed number of occupants		N	1.7134
CO ₂ emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO ₂ emissions from appliances, equation (L14)			17.4175 ZC2
CO ₂ emissions from cooking, equation (L16)			3.1526 ZC3
Total CO ₂ emissions			31.6301 ZC4
Residual CO ₂ emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m ² /year			0.0000 ZC6
Resulting CO ₂ emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO ₂ emissions			31.6301 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					20.0000 / (5) = 0.1575 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4075 (18)
					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)					
External Wall	23.1000	8.4500	14.6500	0.1800	2.6370		(29a)					
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)					
Total net area of external elements Aum(A, m2)			40.6000				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 18.5395		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.2296 (36)					
Total fabric heat loss						(33) + (36) =	22.7691 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 24.3480	Feb 24.2160	Mar 24.0867	Apr 23.4794	May 23.3658	Jun 22.8368	Jul 22.8368	Aug 22.7389	Sep 23.0406	Oct 23.3658	Nov 23.5957	Dec 23.8360 (38)
Heat transfer coeff	47.1170	46.9851	46.8558	46.2485	46.1348	45.6059	45.6059	45.5079	45.8096	46.1348	46.3647	46.6050 (39)
Average = Sum(39)m / 12 =												46.2479 (39)
HLP	Jan 0.9277	Feb 0.9251	Mar 0.9225	Apr 0.9106	May 0.9083	Jun 0.8979	Jul 0.8979	Aug 0.8960	Sep 0.9019	Oct 0.9083	Nov 0.9129	Dec 0.9176 (40)
HLP (average)												0.9106 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan 82.3820	Feb 79.3863	Mar 76.3906	Apr 73.3949	May 70.3992	Jun 67.4035	Jul 67.4035	Aug 70.3992	Sep 73.3949	Oct 76.3906	Nov 79.3863	Dec 82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

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If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d			Gains W
Southeast					6.2400	36.7938	0.6300	0.7000	0.7700			70.1668 (77)
South					2.2100	46.7521	0.6300	0.7000	0.7700			31.5766 (78)
Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains	421.2115	488.9806	537.3716	569.4289	581.3281	561.5651	541.7662	526.3621	510.2428	468.0154	419.7157	398.8747 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	74.8580	75.0681	75.2753	76.2638	76.4516	77.3383	77.3383	77.5048	76.9944	76.4516	76.0726	75.6803
alpha	5.9905	6.0045	6.0184	6.0843	6.0968	6.1559	6.1559	6.1670	6.1330	6.0968	6.0715	6.0454
util living area	0.9889	0.9730	0.9369	0.8513	0.7037	0.5153	0.3699	0.3969	0.6066	0.8695	0.9729	0.9916 (86)
MIT	20.2863	20.4588	20.6606	20.8552	20.9614	20.9951	20.9995	20.9992	20.9872	20.8591	20.5437	20.2519 (87)
Th 2	20.1440	20.1462	20.1484	20.1585	20.1604	20.1693	20.1693	20.1709	20.1658	20.1604	20.1566	20.1526 (88)
util rest of house	0.9856	0.9656	0.9205	0.8177	0.6508	0.4504	0.3003	0.3258	0.5385	0.8324	0.9641	0.9891 (89)
MIT 2	19.2087	19.4566	19.7392	20.0026	20.1264	20.1663	20.1691	20.1706	20.1571	20.0145	19.5885	19.1658 (90)
Living area fraction	19.7506	19.9606	20.2025	20.4313	20.5463	20.5831	20.5866	20.5872	20.5745	20.4392	20.0688	19.7120 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7506	19.9606	20.2025	20.4313	20.5463	20.5831	20.5866	20.5872	20.5745	20.4392	20.0688	19.7120 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9838	0.9637	0.9217	0.8292	0.6757	0.4829	0.3353	0.3616	0.5724	0.8456	0.9630	0.9875 (94)
Useful gains	414.3677	471.2247	495.2826	472.1728	392.8082	271.2034	181.6682	190.3214	292.0435	395.7686	404.2071	393.8892 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	727.9850	707.6224	642.0408	533.3063	408.1214	272.8626	181.8138	190.5525	296.5960	453.9310	601.2941	722.9350 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	233.3313	158.8593	109.1881	44.0161	11.3930	0.0000	0.0000	0.0000	0.0000	43.2728	141.9026	244.8100 (98)
Space heating												986.7733 (98)
Space heating per m2												19.4285 (99)
										(98) / (4) =		

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1055.3725 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	233.3313	158.8593	109.1881	44.0161	11.3930	0.0000	0.0000	0.0000	0.0000	43.2728	141.9026	244.8100	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	249.5522	169.9030	116.7787	47.0761	12.1850	0.0000	0.0000	0.0000	0.0000	46.2811	151.7675	261.8289	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	85.6783	84.9860	83.8697	82.1068	80.5220	79.8000	79.8000	79.8000	79.8000	82.0121	84.5958	85.8659	(216)
Fuel for water heating, kWh/month	196.9753	175.2483	187.0226	171.9951	172.4146	156.2471	150.8144	164.4484	163.8315	178.5184	182.0944	192.0554	(219)
Water heating fuel used												2091.6656	(219)
Annual totals kWh/year													
Space heating fuel - main system												1055.3725	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												3465.4144	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1055.3725	0.2160	227.9605 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2091.6656	0.2160	451.7998 (264)
Space and water heating			679.7602 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			844.9975 (272)
Emissions per m2 for space and water heating			13.3837 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.3837 * 1.55) + 2.4870 + 0.7664, rounded to 2 d.p.			24.0000 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010557				Issued on Date	29/04/2022
Assessment Reference	123	Prop Type Ref				
Property						
SAP Rating	84 B	DER	11.06	TER	24.00	
Environmental	93 A	% DER<TER	53.91			
CO ₂ Emissions (t/year)	0.48	DFEE	29.45	TFEE	31.81	
General Requirements Compliance	Fail	% DFEE<TFEE	7.41			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 24.00 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 11.06 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)31.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)29.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing South East:	6.24 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	454.01 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							3	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.7750 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1163 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)					
External Wall	23.1000	8.4500	14.6500	0.1500	2.1975		(29a)					
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)					
Total net area of external elements Aum(A, m2)			40.6000				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		17.6656		(33)					
Party Wall 1			33.8800	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.5610 (36)					
Total fabric heat loss							(33) + (36) = 23.2266 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 11.1341	Feb 11.0123	Mar 10.8905	Apr 10.2816	May 10.1599	Jun 9.5510	Jul 9.5510	Aug 9.4292	Sep 9.7945	Oct 10.1599	Nov 10.4034	Dec 10.6470 (38)
Heat transfer coeff	34.3607	34.2389	34.1171	33.5082	33.3864	32.7776	32.7776	32.6558	33.0211	33.3864	33.6300	33.8735 (39)
Average = Sum(39)m / 12 =	33.4778 (39)											
HLP	Jan 0.6765	Feb 0.6741	Mar 0.6717	Apr 0.6597	May 0.6573	Jun 0.6454	Jul 0.6454	Aug 0.6430	Sep 0.6501	Oct 0.6573	Nov 0.6621	Dec 0.6669 (40)
HLP (average)	0.6591 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan 82.3820	Feb 79.3863	Mar 76.3906	Apr 73.3949	May 70.3992	Jun 67.4035	Jul 67.4035	Aug 70.3992	Sep 73.3949	Oct 76.3906	Nov 79.3863	Dec 82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												

store volume													110.0000	(47)
b) If manufacturer declared loss factor is not known :														
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152	(51)
Volume factor from Table 2a													1.0294	(52)
Temperature factor from Table 2b													0.6000	(53)
Enter (49) or (54) in (55)													1.0327	(55)
Total storage loss														
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage														
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	(59)
Total heat required for water heating calculated for each month														
177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	62)		
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input														
Output from w/h														
177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	64)		
Heat gains from water heating, kWh/month														
84.8430	75.4698	80.8830	74.7574	74.8902	69.2597	68.7450	72.3625	71.2721	77.4089	79.0216	83.5613	65)		

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.4839	11.9763	9.7398	7.3736	5.5119	4.6534	5.0281	6.5357	8.7723	11.1384	13.0002	13.8587 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	114.0363	112.3063	108.7138	103.8297	100.6589	96.1941	92.3992	97.2615	98.9891	104.0442	109.7522	112.3135 (72)
Total internal gains	325.5065	323.8179	314.0852	298.5244	283.0012	267.8182	257.8112	262.6320	270.4999	286.2317	304.2921	317.5716 (73)

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
Southeast					6.2400	36.7938	0.4000	0.8000	0.7700	50.9147		
South					2.2100	46.7521	0.4000	0.8000	0.7700	22.9127 (77)		
Solar gains	73.8274	124.2516	166.4633	201.0539	220.9821	217.6723	210.5612	195.8614	178.4200	136.3256	88.1434	63.3710 (83)
Total gains	399.3338	448.0695	480.5485	499.5783	503.9832	485.4906	468.3724	458.4934	448.9198	422.5573	392.4355	380.9426 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	102.6489	103.0140	103.3817	105.2603	105.6442	107.6067	107.6067	108.0079	106.8130	105.6442	104.8791	104.1250
alpha	7.8433	7.8676	7.8921	8.0174	8.0429	8.1738	8.1738	8.2005	8.1209	8.0429	7.9919	7.9417
util living area	0.9815	0.9564	0.9000	0.7778	0.6112	0.4318	0.3079	0.3276	0.5065	0.7854	0.9500	0.9860 (86)
MIT	20.6320	20.7516	20.8740	20.9657	20.9950	20.9997	21.0000	21.0000	20.9991	20.9688	20.8079	20.6077 (87)
Th 2	20.3616	20.3637	20.3659	20.3765	20.3787	20.3894	20.3894	20.3915	20.3851	20.3787	20.3744	20.3701 (88)
util rest of house	0.9768	0.9465	0.8804	0.7457	0.5721	0.3908	0.2652	0.2843	0.4618	0.7482	0.9371	0.9823 (89)
MIT 2	19.8820	20.0513	20.2176	20.3409	20.3744	20.3892	20.3893	20.3915	20.3844	20.3480	20.1406	19.8548 (90)
Living area fraction	20.2592	20.4034	20.5477	20.6551	20.6865	20.6962	20.6964	20.6975	20.6935	20.6601	20.4761	0.5029 (91)
MIT	20.2592	20.4034	20.5477	20.6551	20.6865	20.6962	20.6964	20.6975	20.6935	20.6601	20.4761	20.2334 (92)
Temperature adjustment	20.2592	20.4034	20.5477	20.6551	20.6865	20.6962	20.6964	20.6975	20.6935	20.6601	20.4761	0.0000
adjusted MIT	20.2592	20.4034	20.5477	20.6551	20.6865	20.6962	20.6964	20.6975	20.6935	20.6601	20.4761	20.2334 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9760	0.9471	0.8864	0.7603	0.5916	0.4114	0.2867	0.3061	0.4843	0.7654	0.9394	0.9814 (94)
Useful gains	389.7316	424.3886	425.9349	379.8513	298.1356	199.7359	134.2668	140.3312	217.4101	323.4429	368.6451	373.8417 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	548.3668	530.8195	479.2663	393.8908	300.0260	199.8189	134.2703	140.3372	217.7251	335.8724	449.8393	543.1081 (97)
Month fracti	1.0000	1.0000		1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	118.0246	71.5216	39.6786	10.1084	1.4065	0.0000	0.0000	0.0000	0.0000	9.2475	58.4598	125.9343 (98)
Space heating												434.3813 (98)
Space heating per m2												8.5525 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	434.3813 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	486.9415 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	25.6285 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2050.5266 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	107.9225 (310b)
Electricity used for heat distribution	26.7102 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	238.1302 (332)
Energy saving/generation technologies (Appendices M, N and Q)	
Total delivered energy for all uses	3031.1405 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1014.9872	0.5190	526.7784 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	134.9000	0.5190	70.0131 (368)
Electrical energy for heat distribution	26.7102	0.5190	13.8626 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			610.6540 (373)
Space and water heating			610.6540 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	238.1302	0.5190	123.5896 (379)
Energy saving/generation technologies			
PV Unit	-454.0100	0.5190	-235.6312 (380)
Total CO2, kg/year			561.9259 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			11.0600 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			11.0600 ZC1
Total Floor Area		TFA	50.7900
Assumed number of occupants		N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			17.4175 ZC2
CO2 emissions from cooking, equation (L16)			3.1526 ZC3
Total CO2 emissions			31.6301 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			31.6301 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					20.0000 / (5) = 0.1575 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4075 (18)
					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)					
External Wall	23.1000	8.4500	14.6500	0.1800	2.6370		(29a)					
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)					
Total net area of external elements Aum(A, m2)			40.6000				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.5395		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.2296 (36)					
Total fabric heat loss						(33) + (36) =	22.7691 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 24.3480	Feb 24.2160	Mar 24.0867	Apr 23.4794	May 23.3658	Jun 22.8368	Jul 22.8368	Aug 22.7389	Sep 23.0406	Oct 23.3658	Nov 23.5957	Dec 23.8360 (38)
Heat transfer coeff	47.1170	46.9851	46.8558	46.2485	46.1348	45.6059	45.6059	45.5079	45.8096	46.1348	46.3647	46.6050 (39)
Average = Sum(39)m / 12 =												46.2479 (39)
HLP	Jan 0.9277	Feb 0.9251	Mar 0.9225	Apr 0.9106	May 0.9083	Jun 0.8979	Jul 0.8979	Aug 0.8960	Sep 0.9019	Oct 0.9083	Nov 0.9129	Dec 0.9176 (40)
HLP (average)												0.9106 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan 82.3820	Feb 79.3863	Mar 76.3906	Apr 73.3949	May 70.3992	Jun 67.4035	Jul 67.4035	Aug 70.3992	Sep 73.3949	Oct 76.3906	Nov 79.3863	Dec 82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c				Access factor Table 6d	Gains W
Southeast					6.2400	36.7938	0.6300	0.7000				0.7700	70.1668 (77)
South					2.2100	46.7521	0.6300	0.7000				0.7700	31.5766 (78)
Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)	
Total gains	421.2115	488.9806	537.3716	569.4289	581.3281	561.5651	541.7662	526.3621	510.2428	468.0154	419.7157	398.8747 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	74.8580	75.0681	75.2753	76.2638	76.4516	77.3383	77.3383	77.5048	76.9944	76.4516	76.0726	75.6803
alpha	5.9905	6.0045	6.0184	6.0843	6.0968	6.1559	6.1559	6.1670	6.1330	6.0968	6.0715	6.0454
util living area	0.9889	0.9730	0.9369	0.8513	0.7037	0.5153	0.3699	0.3969	0.6066	0.8695	0.9729	0.9916 (86)
MIT	20.2863	20.4588	20.6606	20.8552	20.9614	20.9951	20.9995	20.9992	20.9872	20.8591	20.5437	20.2519 (87)
Th 2	20.1440	20.1462	20.1484	20.1585	20.1604	20.1693	20.1693	20.1709	20.1658	20.1604	20.1566	20.1526 (88)
util rest of house	0.9856	0.9656	0.9205	0.8177	0.6508	0.4504	0.3003	0.3258	0.5385	0.8324	0.9641	0.9891 (89)
MIT 2	19.2087	19.4566	19.7392	20.0026	20.1264	20.1663	20.1691	20.1706	20.1571	20.0145	19.5885	19.1658 (90)
Living area fraction	19.7506	19.9606	20.2025	20.4313	20.5463	20.5831	20.5866	20.5872	20.5745	20.4392	20.0688	19.7120 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7506	19.9606	20.2025	20.4313	20.5463	20.5831	20.5866	20.5872	20.5745	20.4392	20.0688	19.7120 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9838	0.9637	0.9217	0.8292	0.6757	0.4829	0.3353	0.3616	0.5724	0.8456	0.9630	0.9875	(94)
Useful gains	414.3677	471.2247	495.2826	472.1728	392.8082	271.2034	181.6682	190.3214	292.0435	395.7686	404.2071	393.8892	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	727.9850	707.6224	642.0408	533.3063	408.1214	272.8626	181.8138	190.5525	296.5960	453.9310	601.2941	722.9350	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	233.3313	158.8593	109.1881	44.0161	11.3930	0.0000	0.0000	0.0000	0.0000	43.2728	141.9026	244.8100	(98)
Space heating												986.7733	(98)
Space heating per m2												19.4285	(99)
										(98) / (4) =			

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1055.3725 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	233.3313	158.8593	109.1881	44.0161	11.3930	0.0000	0.0000	0.0000	0.0000	43.2728	141.9026	244.8100	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	249.5522	169.9030	116.7787	47.0761	12.1850	0.0000	0.0000	0.0000	0.0000	46.2811	151.7675	261.8289	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	85.6783	84.9860	83.8697	82.1068	80.5220	79.8000	79.8000	79.8000	79.8000	82.0121	84.5958	85.8659	(216)
Fuel for water heating, kWh/month	196.9753	175.2483	187.0226	171.9951	172.4146	156.2471	150.8144	164.4484	163.8315	178.5184	182.0944	192.0554	(219)
Water heating fuel used												2091.6656	(219)
Annual totals kWh/year													
Space heating fuel - main system												1055.3725	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												3465.4144	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1055.3725	0.2160	227.9605 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2091.6656	0.2160	451.7998 (264)
Space and water heating			679.7602 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			844.9975 (272)
Emissions per m2 for space and water heating			13.3837 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.3837 * 1.55) + 2.4870 + 0.7664, rounded to 2 d.p.			24.0000 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010558				Issued on Date	29/04/2022
Assessment Reference	124	Prop Type Ref				
Property						
SAP Rating	84 B	DER	11.18	TER	21.86	
Environmental	92 A	% DER<TER	48.85			
CO ₂ Emissions (t/year)	0.67	DFEE	31.81	TFEE	35.64	
General Requirements Compliance	Fail	% DFEE<TFEE	10.73			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 74 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 21.86 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 11.18 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)35.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)31.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading: Average
Windows facing South East: 6.24 m², No overhang
Windows facing South: 2.21 m², No overhang
Windows facing South West: 9.35 m², No overhang
Windows facing West: 1.97 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 454.01 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

					main	secondary	other			total	m3 per hour		
					heating		heating						
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)	
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)	
Number of intermittent fans											0 * 10 =	0.0000 (7a)	
Number of passive vents											0 * 10 =	0.0000 (7b)	
Number of flueless gas fires											0 * 40 =	0.0000 (7c)	
											Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =										0.0000 / (5) =		0.0000 (8)	
Pressure test											Yes		
Measured/design AP50											3.0000		
Infiltration rate											0.1500 (18)		
Number of sides sheltered											2 (19)		
Shelter factor										(20) = 1 - [0.075 x (19)] =		0.8500 (20)	
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =		0.1275 (21)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)	
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)	
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)	
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation:												0.5000 (23a)	
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)	
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)	

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			19.7700	1.1450	22.6374		(27)					
External Wall	52.9500	19.7700	33.1800	0.1500	4.9770		(29a)					
Corridor	5.4000	1.8900	3.5100	0.2500	0.8775		(29a)					
Total net area of external elements Aum(A, m2)			58.3500				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		30.3819		(33)					
Party Wall 1			34.8500	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							250.0000 (35)					
Total fabric heat loss							9.1430 (36)					
							(33) + (36) = 39.5249 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 17.2447	Feb 17.0514	Mar 16.8580	Apr 15.8913	May 15.6980	Jun 14.7313	Jul 14.7313	Aug 14.5380	Sep 15.1180	Oct 15.6980	Nov 16.0847	Dec 16.4714 (38)
Heat transfer coeff	56.7696	56.5763	56.3829	55.4163	55.2229	54.2562	54.2562	54.0629	54.6429	55.2229	55.6096	55.9963 (39)
Average = Sum(39)m / 12 =												55.3679 (39)
HLP	Jan 0.7722	Feb 0.7695	Mar 0.7669	Apr 0.7538	May 0.7511	Jun 0.7380	Jul 0.7380	Aug 0.7353	Sep 0.7432	Oct 0.7511	Nov 0.7564	Dec 0.7616 (40)
HLP (average)												0.7531 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	Jan 98.4511	Feb 94.8710	Mar 91.2910	Apr 87.7110	May 84.1309	Jun 80.5509	Jul 80.5509	Aug 84.1309	Sep 87.7110	Oct 91.2910	Nov 94.8710	Dec 98.4511 (44)
Energy conte	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Energy content (annual)										Total = Sum(45)m =		1408.1991 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (56)													
If cylinder contains dedicated solar storage													
32.0144 28.9162 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 30.9817 32.0144 30.9817 32.0144 32.0144 (57)													
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month													
201.2769 177.6201 187.0442 168.3717 165.5050 148.6122 143.4181 156.4202 155.8451 174.5575 183.6979 196.6701 196.6701 (62)													
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =													0.0000 (63)
Output from w/h													
201.2769 177.6201 187.0442 168.3717 165.5050 148.6122 143.4181 156.4202 155.8451 174.5575 183.6979 196.6701 196.6701 (64)													
Total per year (kWh/year) = Sum(64)m =													2059.0388 (64)
Heat gains from water heating, kWh/month													
92.7665 82.3997 88.0341 80.9919 80.8723 74.4219 73.5284 77.8516 76.8268 83.8823 86.0878 91.2347 91.2347 (65)													

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)													
(66)m 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 116.4231 (66)													
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
18.3088 16.2617 13.2249 10.0121 7.4842 6.3185 6.8273 8.8744 11.9112 15.1240 17.6520 18.8177 18.8177 (67)													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
205.3693 207.5004 202.1301 190.6974 176.2657 162.7019 153.6405 151.5094 156.8797 168.3123 182.7441 196.3078 196.3078 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 34.6423 (69)													
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)													
-93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 -93.1385 (71)													
Water heating gains (Table 5)													
124.6861 122.6187 118.3254 112.4887 108.6993 103.3637 98.8285 104.6393 106.7039 112.7450 119.5664 122.6273 122.6273 (72)													
Total internal gains													
406.2912 404.3077 391.6074 371.1252 350.3761 330.3110 317.2233 322.9500 333.4217 354.1083 377.8894 395.6798 395.6798 (73)													

6. Solar gains

[Jan]													
Area m2													
Solar flux Table 6a W/m2													
Specific data or Table 6b													
Specific data or Table 6c													
Access factor Table 6d													
Gains W													
Southeast	6.2400	36.7938	0.4000	0.8000	0.7700	50.9147 (77)							
South	2.2100	46.7521	0.4000	0.8000	0.7700	22.9127 (78)							
Southwest	9.3500	36.7938	0.4000	0.8000	0.7700	76.2904 (79)							
West	1.9700	19.6403	0.4000	0.8000	0.7700	8.5802 (80)							
Solar gains	158.6979	270.9870	371.9096	461.6762	517.1520	513.2277	494.8979	453.6712	403.0932	299.8653	190.2202	135.7156 (83)	
Total gains	564.9891	675.2948	763.5169	832.8014	867.5282	843.5387	812.1211	776.6213	736.5149	653.9736	568.1096	531.3954 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)													
tau 89.9347 90.2420 90.5514 92.1310 92.4536 94.1008 94.1008 94.4373 93.4349 92.4536 91.8107 91.1767 91.1767 (86)													
alpha 6.9956 7.0161 7.0368 7.1421 7.1636 7.2734 7.2734 7.2958 7.2290 7.1636 7.1207 7.0784 7.0784 (86)													
util living area 0.9890 0.9652 0.9034 0.7649 0.5863 0.4113 0.2939 0.3202 0.5099 0.8137 0.9678 0.9923 (86)													
MIT 20.4660 20.6444 20.8245 20.9538 20.9932 20.9996 21.0000 20.9999 20.9980 20.9419 20.6929 20.4317 (87)													
Th 2 20.2775 20.2798 20.2821 20.2936 20.2959 20.3074 20.3074 20.3097 20.3028 20.2959 20.2913 20.2867 (88)													
util rest of house 0.9859 0.9565 0.8831 0.7298 0.5439 0.3669 0.2477 0.2722 0.4593 0.7747 0.9582 0.9901 (89)													
MIT 2 19.5743 19.8291 20.0754 20.2460 20.2901 20.3071 20.3074 20.3097 20.3014 20.2378 19.9100 19.5323 (90)													
Living area fraction fLA = Living area / (4) =													
MIT 19.9022 20.1289 20.3509 20.5063 20.5487 20.5618 20.5621 20.5636 20.5576 20.4967 20.1979 19.8631 (92)													
Temperature adjustment 0.0000													
adjusted MIT 19.9022 20.1289 20.3509 20.5063 20.5487 20.5618 20.5621 20.5636 20.5576 20.4967 20.1979 19.8631 (93)													

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.9840 0.9544 0.8852 0.7407 0.5592 0.3832 0.2647 0.2898 0.4779 0.7863 0.9568 0.9884 (94)													
Useful gains	555.9318	644.5010	675.8881	616.8285	485.1215	323.2778	214.9595	225.0750	351.9614	514.2465	543.5409	525.2536 (95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W	885.7334	861.5951	780.9539	643.1784	488.6489	323.4649	214.9695	225.0940	352.8633	546.5273	728.3705	877.0750 (97)	
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)	
Space heating kWh	245.3724	145.8872	78.1690	18.9719	2.6244	0.0000	0.0000	0.0000	0.0000	24.0169	133.0773	261.7551 (98)	
Space heating													
Space heating per m2													
(98) / (4) =													12.3759 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump	0.9500	(303a)
Fraction of heat from community Boilers	0.0500	(303b)
Fraction of total space heat from community Heat pump	0.9500	(304a)
Fraction of total space heat from community Boilers	0.0500	(304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.1800	(306)
Space heating:		
Annual space heating requirement	909.8743	(98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1019.9690	(307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	53.6826	(307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	2059.0388	(64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2308.1825	(310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	121.4833	(310b)
Electricity used for heat distribution	35.0332	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)		
mechanical ventilation fans (SFP = 0.7625)	170.9800	(330a)
Total electricity for the above, kWh/year	170.9800	(331)
Electricity for lighting (calculated in Appendix L)	323.3395	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
Total delivered energy for all uses	3997.6369	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			250.0000	(367a)
Space heating from Heat pump	1331.2606	0.5190	690.9243	(367)
Efficiency of heat source Boilers			99.0000	(367b)
Space heating from Boilers	176.9352	0.5190	91.8294	(368)
Electrical energy for heat distribution	35.0332	0.5190	18.1822	(372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			800.9359	(373)
Space and water heating			800.9359	(376)
Pumps and fans	170.9800	0.5190	88.7386	(378)
Energy for lighting	323.3395	0.5190	167.8132	(379)
Energy saving/generation technologies				
PV Unit	-454.0100	0.5190	-235.6312	(380)
Total CO2, kg/year			821.8565	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			11.1800	(384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			11.1800	ZC1
Total Floor Area		TFA	73.5200	
Assumed number of occupants		N	2.3285	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.5530	ZC2
CO2 emissions from cooking, equation (L16)			2.3787	ZC3
Total CO2 emissions			30.1117	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			30.1117	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 30.0000 / (5) = 0.1632 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4132 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3512 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4478	0.4390	0.4303	0.3864	0.3776	0.3337	0.3337	0.3249	0.3512	0.3776	0.3951	0.4127 (22b)
Effective ac	0.6003	0.5964	0.5926	0.5746	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			16.4900	1.3258	21.8617		(27)					
External Wall	52.9500	16.4900	36.4600	0.1800	6.5628		(29a)					
Corridor	5.4000	1.8900	3.5100	0.1800	0.6318		(29a)					
Total net area of external elements Aum(A, m2)			58.3500				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.9463		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.0636 (36)					
Total fabric heat loss						(33) + (36) =	38.0099 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 36.4091	Feb 36.1729	Mar 35.9414	Apr 34.8541	May 34.6506	Jun 33.7036	Jul 33.7036	Aug 33.5282	Sep 34.0684	Oct 34.6506	Nov 35.0622	Dec 35.4924 (38)
Heat transfer coeff	74.4190	74.1828	73.9514	72.8640	72.6606	71.7135	71.7135	71.5382	72.0783	72.6606	73.0721	73.5024 (39)
Average = Sum(39)m / 12 =												72.8630 (39)
HLP	Jan 1.0122	Feb 1.0090	Mar 1.0059	Apr 0.9911	May 0.9883	Jun 0.9754	Jul 0.9754	Aug 0.9730	Sep 0.9804	Oct 0.9883	Nov 0.9939	Dec 0.9998 (40)
HLP (average)												0.9911 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy conte	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Energy content (annual)										Total = Sum(45)m =		1408.1991 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
	85.8210	76.1264	81.0886	74.2704	73.9268	67.7004	66.5829	70.9061	70.1053	76.9367	79.3664	84.2892 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3070	16.2601	13.2236	10.0111	7.4834	6.3178	6.8266	8.8735	11.9100	15.1225	17.6502	18.8158	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	(71)
Water heating gains (Table 5)	115.3508	113.2833	108.9900	103.1533	99.3640	94.0283	89.4931	95.3039	97.3685	103.4096	110.2311	113.2919	(72)
Total internal gains	399.9539	397.9707	385.2706	364.7888	344.0400	323.9750	310.8872	316.6137	327.0851	347.7714	371.5522	389.3425	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g	Specific data or Table 6b	FF	Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast				5.2100	36.7938		0.6300		0.7000	0.7700	58.5847 (77)	
South				1.8400	46.7521		0.6300		0.7000	0.7700	26.2900 (78)	
Southwest				7.8000	36.7938		0.6300		0.7000	0.7700	87.7085 (79)	
West				1.6400	19.6403		0.6300		0.7000	0.7700	9.8438 (80)	
Solar gains	182.4270	311.5043	427.5134	530.6984	594.4675	589.9567	568.8863	521.4963	463.3582	344.6994	218.6622	156.0085 (83)
Total gains	582.3809	709.4749	812.7841	895.4872	938.5075	913.9316	879.7735	838.1100	790.4433	692.4707	590.2145	545.3510 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.6055	68.8239	69.0394	70.0696	70.2658	71.1937	71.1937	71.3683	70.8334	70.2658	69.8701	69.4611	
alpha	5.5737	5.5883	5.6026	5.6713	5.6844	5.7462	5.7462	5.7579	5.7222	5.6844	5.6580	5.6307	
util living area	0.9922	0.9772	0.9390	0.8434	0.6850	0.4974	0.3580	0.3915	0.6120	0.8849	0.9800	0.9944	(86)
MIT	20.1287	20.3430	20.5945	20.8337	20.9567	20.9942	20.9993	20.9988	20.9820	20.8119	20.4251	20.0904	(87)
Th 2	20.0732	20.0758	20.0784	20.0908	20.0931	20.1039	20.1039	20.1059	20.0997	20.0931	20.0884	20.0835	(88)
util rest of house	0.9898	0.9706	0.9225	0.8076	0.6290	0.4299	0.2855	0.3160	0.5391	0.8487	0.9731	0.9926	(89)
MIT 2	18.9267	19.2363	19.5898	19.9131	20.0555	20.1004	20.1036	20.1054	20.0875	19.8964	19.3668	18.8791	(90)
Living area fraction	19.3688	19.6434	19.9593	20.2517	20.3869	20.4291	20.4330	20.4340	20.4165	20.2331	19.7560	19.3246	(92)
Temperature adjustment	19.3688	19.6434	19.9593	20.2517	20.3869	20.4291	20.4330	20.4340	20.4165	20.2331	19.7560	19.3246	(93)
adjusted MIT	19.3688	19.6434	19.9593	20.2517	20.3869	20.4291	20.4330	20.4340	20.4165	20.2331	19.7560	19.3246	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9874	0.9668	0.9201	0.8144	0.6477	0.4546	0.3122	0.3438	0.5653	0.8549	0.9700	0.9907	(94)
Ext temp.	575.0202	685.9200	747.8324	729.2656	607.8729	415.4799	274.6429	288.1747	446.8606	592.0102	572.4993	540.2693	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1121.4021	1093.7042	995.3329	827.1285	631.1973	418.0258	274.8792	288.5832	455.2835	699.9457	924.8020	1111.6934	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	406.5081	274.0310	184.1403	70.4612	17.3534	0.0000	0.0000	0.0000	0.0000	80.3041	253.6580	425.1395	(98)
Space heating per m2												1711.5957	(98)
												23.2807	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1830.5836 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	406.5081	274.0310	184.1403	70.4612	17.3534	0.0000	0.0000	0.0000	0.0000	80.3041	253.6580	425.1395	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	434.7680	293.0813	196.9415	75.3596	18.5598	0.0000	0.0000	0.0000	0.0000	85.8867	271.2920	454.6947	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882	(64)
Efficiency of water heater (217)m	86.7602	86.0844	84.8989	82.7932	80.7512	79.8000	79.8000	79.8000	79.8000	83.0011	85.7986	86.9264	(216)
Fuel for water heating, kWh/month	221.9854	197.2232	210.0879	193.2161	194.2052	175.7022	168.8423	185.1357	184.7660	199.8474	204.3109	216.2615	(219)
Water heating fuel used												2351.5838	(219)
Annual totals kWh/year													
Space heating fuel - main system												1830.5836	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												323.3067	(232)
Total delivered energy for all uses												4580.4741	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1830.5836	0.2160	395.4061 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2351.5838	0.2160	507.9421 (264)
Space and water heating			903.3481 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	323.3067	0.5190	167.7962 (268)
Total CO2, kg/m2/year			1110.0693 (272)
Emissions per m2 for space and water heating			12.2871 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.2823 (272b)
Emissions per m2 for pumps and fans			0.5294 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.2871 * 1.55) + 2.2823 + 0.5294, rounded to 2 d.p.			21.8600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010559			Issued on Date	29/04/2022
Assessment Reference	125	Prop Type Ref			
Property					
SAP Rating	83 B	DER	14.62	TER	27.36
Environmental	90 B	% DER<TER	46.57		
CO ₂ Emissions (t/year)	0.82	DFEE	45.80	TFEE	53.03
General Requirements Compliance	Pass	% DFEE<TFEE	13.64		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 27.36 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.62 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)53.0 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)45.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.61	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing West:	5.88 m ² , No overhang
Windows facing North West:	7.07 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	454.01 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							2	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1275 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			12.9500	1.1450	14.8282		(27)					
External Wall	35.0800	12.9500	22.1300	0.1500	3.3195		(29a)					
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)					
Core	18.2300		18.2300	0.2500	4.5575		(29a)					
Main Roof	72.7700		72.7700	0.1000	7.2770		(30)					
Total net area of external elements Aum(A, m2)			143.5800				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		35.7747		(33)					
Party Wall 1			18.3000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.2124 (36)					
Total fabric heat loss							(33) + (36) = 45.9871 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 17.0688	Feb 16.8774	Mar 16.6860	Apr 15.7292	May 15.5379	Jun 14.5811	Jul 14.5811	Aug 14.3897	Sep 14.9638	Oct 15.5379	Nov 15.9206	Dec 16.3033 (38)
Heat transfer coeff	63.0559	62.8646	62.6732	61.7164	61.5250	60.5682	60.5682	60.3768	60.9509	61.5250	61.9077	62.2905 (39)
Average = Sum(39)m / 12 =												61.6685 (39)
HLP	Jan 0.8665	Feb 0.8639	Mar 0.8613	Apr 0.8481	May 0.8455	Jun 0.8323	Jul 0.8323	Aug 0.8297	Sep 0.8376	Oct 0.8455	Nov 0.8507	Dec 0.8560 (40)
HLP (average)												0.8474 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	Jan 98.0067	Feb 94.4428	Mar 90.8789	Apr 87.3151	May 83.7512	Jun 80.1873	Jul 80.1873	Aug 83.7512	Sep 87.3151	Oct 90.8789	Nov 94.4428	Dec 98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)												Total = Sum(45)m = 1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)
Water storage loss:												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(64)
Total per year (kWh/year) = Sum(64)m =												2052.6825 (64)
Heat gains from water heating, kWh/month												
92.5474	82.2081	87.8363	80.8195	80.7069	74.2791	73.3961	77.6998	76.6732	83.7032	85.8924	91.0225	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
18.2553	16.2142	13.1863	9.9829	7.4623	6.3000	6.8074	8.8485	11.8764	15.0798	17.6004	18.7627	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	(71)
Water heating gains (Table 5)												
124.3916	122.3335	118.0596	112.2492	108.4770	103.1654	98.6507	104.4353	106.4905	112.5044	119.2950	122.3421	(72)
Total internal gains												
403.9925	402.0068	389.3790	369.0270	348.4216	328.4959	315.5019	321.2141	331.6232	352.1788	375.8026	393.4637	(73)

6. Solar gains

[Jan]				Area	Solar flux			g	FF			Access			Gains
				m2	Table 6a			Specific data	Specific data			factor			W
					W/m2			or Table 6b	or Table 6c			Table 6d			
West				5.8800	19.6403			0.4000	0.8000			0.7700			25.6099 (80)
Northwest				7.0700	11.2829			0.4000	0.8000			0.7700			17.6899 (81)
Solar gains	43.2998	86.1067	147.3804	226.8726	290.6833	303.6424	286.5514	237.3201	175.0084	103.4509	54.1910			35.5068 (83)	
Total gains	447.2923	488.1134	536.7594	595.8996	639.1049	632.1383	602.0533	558.5342	506.6316	455.6297	429.9935			428.9705 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1427	80.3867	80.6321	81.8822	82.1369	83.4344	83.4344	83.6988	82.9105	82.1369	81.6291	81.1275
alpha	6.3428	6.3591	6.3755	6.4588	6.4758	6.5623	6.5623	6.5799	6.5274	6.4758	6.4419	6.4085
util living area	0.9975	0.9950	0.9854	0.9422	0.8139	0.6034	0.4415	0.4947	0.7746	0.9653	0.9942	0.9981 (86)
MIT	20.1741	20.2832	20.4826	20.7470	20.9289	20.9915	20.9990	20.9981	20.9615	20.7267	20.4090	20.1568 (87)
Th 2	20.1961	20.1983	20.2006	20.2118	20.2141	20.2254	20.2254	20.2277	20.2209	20.2141	20.2096	20.2051 (88)
util rest of house	0.9967	0.9934	0.9806	0.9240	0.7669	0.5347	0.3644	0.4130	0.7071	0.9506	0.9921	0.9974 (89)
MIT 2	19.0868	19.2474	19.5376	19.9168	20.1467	20.2199	20.2250	20.2269	20.1912	19.8971	19.4399	19.0685 (90)
Living area fraction									fLA = Living area / (4) =			0.3848 (91)
MIT	19.5052	19.6459	19.9012	20.2362	20.4477	20.5168	20.5228	20.5236	20.4876	20.2163	19.8128	19.4872 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5052	19.6459	19.9012	20.2362	20.4477	20.5168	20.5228	20.5236	20.4876	20.2163	19.8128	19.4872 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9957	0.9919	0.9784	0.9246	0.7817	0.5609	0.3941	0.4445	0.7315	0.9506	0.9907	0.9967 (94)
Useful gains	445.3911	484.1661	525.1771	550.9971	499.5890	354.5725	237.2773	248.2905	370.5910	433.1437	425.9768	427.5443 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	958.7761	926.9968	839.8961	699.6299	538.2012	358.3692	237.5998	248.9696	389.3289	591.6441	787.0180	952.2493 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	381.9585	297.5822	234.1509	107.0156	28.7274	0.0000	0.0000	0.0000	0.0000	117.9243	259.9497	390.3805 (98)
Space heating												1817.6892 (98)
Space heating per m2												(98) / (4) = 24.9786 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1817.6892 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	2037.6296 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	107.2437 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2052.6825 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2301.0570 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	121.1083 (310b)
Electricity used for heat distribution	45.6704 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	169.2357 (330a)
Total electricity for the above, kWh/year	169.2357 (331)
Electricity for lighting (calculated in Appendix L)	322.3944 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	5058.6687 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1735.4746	0.5190	900.7113 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	230.6585	0.5190	119.7118 (368)
Electrical energy for heat distribution	45.6704	0.5190	23.7029 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1044.1260 (373)
Space and water heating			1044.1260 (376)
Pumps and fans	169.2357	0.5190	87.8333 (378)
Energy for lighting	322.3944	0.5190	167.3227 (379)
Energy saving/generation technologies			
PV Unit	-454.0100	0.5190	-235.6312 (380)
Total CO2, kg/year			1063.6509 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.6200 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			14.6200 ZC1
Total Floor Area		TFA	72.7700
Assumed number of occupants		N	2.3115
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.5855 ZC2
CO2 emissions from cooking, equation (L16)			2.3976 ZC3
Total CO2 emissions			33.6031 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			33.6031 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1649 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4149 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3527 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4497	0.4408	0.4320	0.3879	0.3791	0.3350	0.3350	0.3262	0.3527	0.3791	0.3968	0.4144 (22b)
Effective ac	0.6011	0.5972	0.5933	0.5752	0.5719	0.5561	0.5561	0.5532	0.5622	0.5719	0.5787	0.5859 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900			(26)				
TER Opening Type (Uw = 1.40)			12.9500	1.3258	17.1686			(27)				
External Wall	35.0800	12.9500	22.1300	0.1800	3.9834			(29a)				
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098			(29a)				
Core	18.2300		18.2300	0.1800	3.2814			(29a)				
Main Roof	72.7700		72.7700	0.1300	9.4601			(30)				
Total net area of external elements Aum(A, m2)			143.5800					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	38.5933			(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								8.0924 (36)				
Total fabric heat loss						(33) + (36) =		46.6857 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 36.0868	Feb 35.8511	Mar 35.6201	Apr 34.5351	May 34.3321	Jun 33.3870	Jul 33.3870	Aug 33.2120	Sep 33.7511	Oct 34.3321	Nov 34.7427	Dec 35.1721 (38)
Heat transfer coeff	82.7724	82.5368	82.3058	81.2207	81.0177	80.0727	80.0727	79.8977	80.4367	81.0177	81.4284	81.8577 (39)
Average = Sum(39)m / 12 =												81.2198 (39)
HLP	Jan 1.1375	Feb 1.1342	Mar 1.1310	Apr 1.1161	May 1.1133	Jun 1.1004	Jul 1.1004	Aug 1.0979	Sep 1.1054	Oct 1.1133	Nov 1.1190	Dec 1.1249 (40)
HLP (average)												1.1161 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)										Total = Sum(45)m =		1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												
21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133	(46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

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Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (64)
Heat gains from water heating, kWh/month	85.6018	75.9347	80.8908	74.0980	73.7613	67.5576	66.4506	70.7543	69.9517	76.7577	79.1709	84.0770 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5798	16.5024	13.4206	10.1603	7.5949	6.4120	6.9283	9.0057	12.0875	15.3478	17.9132	19.0961	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	(71)
Water heating gains (Table 5)	115.0562	112.9981	108.7242	102.9139	99.1416	93.8300	89.3153	95.0999	97.1551	103.1690	109.9597	113.0067	(72)
Total internal gains	397.9816	395.9596	383.2780	362.8690	342.2188	322.2725	309.2875	315.0360	325.4989	346.1114	369.7800	387.4618	(73)

6. Solar gains

[Jan]				Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c				Access factor Table 6d			Gains W
West				5.8800	19.6403	0.6300	0.7000				0.7700			35.2936 (80)
Northwest				7.0700	11.2829	0.6300	0.7000				0.7700			24.3789 (81)
Solar gains	59.6725	118.6657	203.1086	312.6588	400.5979	418.4572	394.9036	327.0568	241.1834	142.5683	74.6819			48.9328 (83)
Total gains	457.6541	514.6253	586.3866	675.5278	742.8167	740.7297	704.1911	642.0927	566.6823	488.6797	444.4619			436.3946 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.0526	61.2269	61.3988	62.2190	62.3749	63.1110	63.1110	63.2493	62.8254	62.3749	62.0603	61.7348
alpha	5.0702	5.0818	5.0933	5.1479	5.1583	5.2074	5.2074	5.2166	5.1884	5.1583	5.1374	5.1157
util living area	0.9975	0.9950	0.9862	0.9496	0.8435	0.6570	0.4934	0.5586	0.8296	0.9738	0.9950	0.9981 (86)
MIT	19.8025	19.9429	20.2033	20.5568	20.8351	20.9664	20.9937	20.9885	20.8895	20.5235	20.1049	19.7817 (87)
Th 2	19.9704	19.9730	19.9756	19.9877	19.9900	20.0005	20.0005	20.0025	19.9965	19.9900	19.9854	19.9806 (88)
util rest of house	0.9967	0.9934	0.9813	0.9314	0.7927	0.5685	0.3850	0.4445	0.7558	0.9610	0.9930	0.9974 (89)
MIT 2	18.3772	18.5837	18.8632	19.4716	19.8324	19.9790	19.9983	19.9979	19.9088	19.4359	18.8298	18.3541 (90)
Living area fraction	18.9256	19.1067	19.4404	19.8891	20.2182	20.3589	20.3813	20.3790	20.2861	fLA = Living area / (4) =		0.3848 (91)
MIT	18.9256	19.1067	19.4404	19.8891	20.2182	20.3589	20.3813	20.3790	20.2861	19.8544	19.3204	18.9034 (92)
Temperature adjustment	18.9256	19.1067	19.4404	19.8891	20.2182	20.3589	20.3813	20.3790	20.2861	19.8544	19.3204	18.9034 (93)
adjusted MIT	18.9256	19.1067	19.4404	19.8891	20.2182	20.3589	20.3813	20.3790	20.2861	19.8544	19.3204	18.9034 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	455.5957	510.1999	573.4353	627.7683	598.1993	445.5574	300.6375	313.7616	441.6855	468.5325	440.5200	434.8414	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1210.5949	1172.5718	1065.0682	892.5456	690.1263	461.1302	302.7778	317.9156	497.5932	749.7714	995.0887	1203.5901	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	561.7194	445.1140	365.7749	190.6396	68.3937	0.0000	0.0000	0.0000	0.0000	209.2417	399.2895	571.9490	(98)
Space heating												2812.1217	(98)
Space heating per m ²												38.6440	(99)

8c. Space cooling requirement

Not applicable

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3007.6168 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	561.7194	445.1140	365.7749	190.6396	68.3937	0.0000	0.0000	0.0000	0.0000	209.2417	399.2895	571.9490	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	600.7694	476.0577	391.2031	203.8927	73.1483	0.0000	0.0000	0.0000	0.0000	223.7879	427.0476	611.7102	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500	(64)
Efficiency of water heater (217)m	87.5117	87.2768	86.6980	85.2913	82.7787	79.8000	79.8000	79.8000	79.8000	85.4431	86.9514	87.6018	(216)
Fuel for water heating, kWh/month	219.3262	193.8683	205.0421	186.9491	188.8475	175.1642	168.3438	184.5636	184.1870	193.5056	200.9265	213.8656	(219)
Water heating fuel used												2314.5895	(219)
Annual totals kWh/year													
Space heating fuel - main system												3007.6168	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												328.1242	(232)
Total delivered energy for all uses												5725.3305	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3007.6168	0.2160	649.6452 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2314.5895	0.2160	499.9513 (264)
Space and water heating			1149.5966 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	328.1242	0.5190	170.2965 (268)
Total CO2, kg/m2/year			1358.8180 (272)
Emissions per m2 for space and water heating			15.7977 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3402 (272b)
Emissions per m2 for pumps and fans			0.5349 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.7977 * 1.55) + 2.3402 + 0.5349, rounded to 2 d.p.			27.3600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010560			Issued on Date	29/04/2022
Assessment Reference	130	Prop Type Ref			
Property					
SAP Rating	83 B	DER	13.26	TER	27.16
Environmental	92 A	% DER<TER	51.17		
CO ₂ Emissions (t/year)	0.54	DFEE	38.80	TFEE	42.54
General Requirements Compliance	Pass	% DFEE<TFEE	8.81		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 27.16 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.26 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)42.5 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)38.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.20 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing South East:	6.24 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	454.01 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)
External Wall	23.1000	8.4500	14.6500	0.1500	2.1975		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Main Roof	50.7900		50.7900	0.1000	5.0790		(30)
Total net area of external elements Aum(A, m ²)			91.3900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.7446		(33)
Party Wall 1			33.8800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.4882 (36)
Total fabric heat loss							(33) + (36) = 31.2328 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	11.1341	11.0123	10.8905	10.2816	10.1599	9.5510	9.5510	9.4292	9.7945	10.1599	10.4034	10.6470 (38)
Average = Sum(39)m / 12 =	42.3669	42.2451	42.1233	41.5144	41.3926	40.7838	40.7838	40.6620	41.0273	41.3926	41.6362	41.8797 (39)
												41.4840 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8342	0.8318	0.8294	0.8174	0.8150	0.8030	0.8030	0.8006	0.8078	0.8150	0.8198	0.8246 (40)
Days in month												0.8168 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy content (annual)	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1178.3544 (45)
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
	Solar input (sum of months) = Sum (63)m =											0.0000 (63)	
Output from w/h													
	177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(64)
	Total per year (kWh/year) = Sum (64)m =											1829.1942 (64)	
Heat gains from water heating, kWh/month													
	84.8430	75.4698	80.8830	74.7574	74.8902	69.2597	68.7450	72.3625	71.2721	77.4089	79.0216	83.5613	(65)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9851	0.9693	0.9347	0.8524	0.7037	0.5036	0.3505	0.3747	0.5881	0.8562	0.9656	0.9883 (94)
Useful gains	393.3825	434.3017	449.1835	425.8219	354.6490	244.4877	164.1587	171.7879	264.0226	361.7868	378.9436	376.5027 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	661.1352	640.9511	580.3497	480.8899	367.9875	245.7045	164.2477	171.9266	267.3893	409.8825	544.8386	656.4630 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	199.2081	138.8684	97.5876	39.6490	9.9238	0.0000	0.0000	0.0000	0.0000	35.7832	119.4444	208.2905 (98)
Space heating												848.7550 (99)
Space heating per m2												16.7111 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	848.7550 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	951.4544 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	50.0765 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2050.5266 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	107.9225 (310b)
Electricity used for heat distribution	31.5998 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	238.1302 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	3520.1015 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1200.7924	0.5190	623.2113 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	159.5950	0.5190	82.8298 (368)
Electrical energy for heat distribution	31.5998	0.5190	16.4003 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			722.4413 (373)
Space and water heating			722.4413 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	238.1302	0.5190	123.5896 (379)
Energy saving/generation technologies			
PV Unit	-454.0100	0.5190	-235.6312 (380)
Total CO2, kg/year			673.7132 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			13.2600 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		13.2600 ZC1
Total Floor Area	TFA	50.7900
Assumed number of occupants	N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.4175 ZC2
CO2 emissions from cooking, equation (L16)		3.1526 ZC3
Total CO2 emissions		33.8301 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		33.8301 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 20.0000 / (5) = 0.1575 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4075 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
Effective ac	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)
External Wall	23.1000	8.4500	14.6500	0.1800	2.6370		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Main Roof	50.7900		50.7900	0.1300	6.6027		(30)
Total net area of external elements Aum(A, m ²)			91.3900				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	25.1422	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.0180 (36)
Total fabric heat loss						(33) + (36) =	31.1602 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	24.3480	24.2160	24.0867	23.4794	23.3658	22.8368	22.8368	22.7389	23.0406	23.3658	23.5957	23.8360 (38)
Heat transfer coeff	55.5081	55.3762	55.2469	54.6396	54.5259	53.9970	53.9970	53.8990	54.2007	54.5259	54.7558	54.9961 (39)
Average = Sum(39)m / 12 =												54.6390 (39)
HLP	1.0929	1.0903	1.0878	1.0758	1.0736	1.0631	1.0631	1.0612	1.0672	1.0736	1.0781	1.0828 (40)
HLP (average)												1.0758 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy content (annual)	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1178.3544 (45)
Water storage loss:	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
Heat gains from water heating, kWh/month	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415	(73)

6. Solar gains

[Jan]		Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W					
Southeast		6.2400	36.7938	0.6300	0.7000	0.7700	70.1668 (77)					
South		2.2100	46.7521	0.6300	0.7000	0.7700	31.5766 (78)					
Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains	421.2115	488.9806	537.3716	569.4289	581.3281	561.5651	541.7662	526.3621	510.2428	468.0154	419.7157	398.8747 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	63.5418	63.6931	63.8422	64.5518	64.6863	65.3200	65.3200	65.4387	65.0745	64.6863	64.4148	64.1333	
alpha	5.2361	5.2462	5.2561	5.3035	5.3124	5.3547	5.3547	5.3626	5.3383	5.3124	5.2943	5.2756	
util living area	0.9912	0.9802	0.9560	0.8970	0.7790	0.5970	0.4355	0.4666	0.6896	0.9103	0.9803	0.9932	(86)
MIT	20.0480	20.2293	20.4626	20.7181	20.8983	20.9806	20.9969	20.9956	20.9585	20.7355	20.3449	20.0120	(87)
Th 2	20.0066	20.0088	20.0108	20.0207	20.0225	20.0310	20.0310	20.0326	20.0277	20.0225	20.0188	20.0149	(88)
util rest of house	0.9884	0.9743	0.9429	0.8674	0.7225	0.5144	0.3412	0.3708	0.6088	0.8781	0.9734	0.9911	(89)
MIT 2	18.7600	19.0223	19.3541	19.7084	19.9297	20.0190	20.0300	20.0309	19.9985	19.7401	19.1987	18.7140	(90)
Living area fraction									fLA = Living area / (4) =			0.5029	(91)
MIT	19.4077	19.6293	19.9115	20.2162	20.4168	20.5025	20.5162	20.5160	20.4812	20.2407	19.7751	19.3667	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4077	19.6293	19.9115	20.2162	20.4168	20.5025	20.5162	20.5160	20.4812	20.2407	19.7751	19.3667	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	415.4362	475.0404	505.8639	497.6041	433.9552	311.8915	210.6254	220.5971	330.5882	414.7289	407.6338	394.5855	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	838.5986	815.6512	740.9441	618.3098	475.2901	318.7174	211.4642	221.8502	345.8678	525.6658	694.0329	834.1115	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	314.8328	228.8905	174.8996	86.9081	30.7532	0.0000	0.0000	0.0000	0.0000	82.5370	206.2074	327.0073	(98)
Space heating												1452.0359	(98)
Space heating per m2												(98) / (4) =	28.5890 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1552.9796 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	314.8328	228.8905	174.8996	86.9081	30.7532	0.0000	0.0000	0.0000	0.0000	82.5370	206.2074	327.0073	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	336.7196	244.8026	187.0584	92.9499	32.8911	0.0000	0.0000	0.0000	0.0000	88.2749	220.5426	349.7404	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	86.4545	85.9567	85.1047	83.5639	81.5485	79.8000	79.8000	79.8000	79.8000	83.3528	85.5925	86.6070	(216)
Fuel for water heating, kWh/month	195.2067	173.2692	184.3087	168.9959	170.2445	156.2471	150.8144	164.4484	163.8315	175.6470	179.9739	190.4121	(219)
Water heating fuel used												2073.3994	(219)
Annual totals kWh/year													
Space heating fuel - main system												1552.9796	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												3944.7553	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1552.9796	0.2160	335.4436 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2073.3994	0.2160	447.8543 (264)
Space and water heating			783.2979 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			948.5352 (272)
Emissions per m2 for space and water heating			15.4223 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.4223 * 1.55) + 2.4870 + 0.7664, rounded to 2 d.p.			27.1600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010561			Issued on Date	29/04/2022
Assessment Reference	131	Prop Type Ref			
Property					
SAP Rating	83 B	DER	13.08	TER	24.74
Environmental	91 B	% DER<TER	47.14		
CO ₂ Emissions (t/year)	0.77	DFEE	39.48	TFEE	45.24
General Requirements Compliance	Fail	% DFEE<TFEE	12.73		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 74 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 24.74 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.08 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 45.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 39.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading: Average
Windows facing South East: 6.24 m², No overhang
Windows facing South: 2.21 m², No overhang
Windows facing South West: 9.35 m², No overhang
Windows facing West: 1.97 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 454.01 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												75.6500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			19.7700	1.1450	22.6374		(27)
External Wall	52.9500	19.7700	33.1800	0.1500	4.9770		(29a)
Corridor	5.4000	1.8900	3.5100	0.2500	0.8775		(29a)
Main Roof	73.5200		73.5200	0.1000	7.3520		(30)
Total net area of external elements Aum(A, m ²)			131.8700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	37.7339			(33)
Party Wall 1			34.8500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.0218 (36)
Total fabric heat loss							(33) + (36) = 49.7557 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	17.2447	17.0514	16.8580	15.8913	15.6980	14.7313	14.7313	14.5380	15.1180	15.6980	16.0847	16.4714 (38)
Heat transfer coeff	67.0004	66.8071	66.6137	65.6471	65.4537	64.4870	64.4870	64.2937	64.8737	65.4537	65.8404	66.2271 (39)
Average = Sum(39)m / 12 =												65.5987 (39)
HLP	0.9113	0.9087	0.9061	0.8929	0.8903	0.8771	0.8771	0.8745	0.8824	0.8903	0.8955	0.9008 (40)
HLP (average)												0.8923 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy content (annual)	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1408.1991 (45)
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	201.2769	177.6201	187.0442	168.3717	165.5050	148.6122	143.4181	156.4202	155.8451	174.5575	183.6979	196.6701	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
	Solar input (sum of months) = Sum (63)m =											0.0000 (63)	
Output from w/h													
	201.2769	177.6201	187.0442	168.3717	165.5050	148.6122	143.4181	156.4202	155.8451	174.5575	183.6979	196.6701	(64)
	Total per year (kWh/year) = Sum (64)m =											2059.0388 (64)	
Heat gains from water heating, kWh/month													
	92.7665	82.3997	88.0341	80.9919	80.8723	74.4219	73.5284	77.8516	76.8268	83.8823	86.0878	91.2347	(65)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1426.9750 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1599.6389 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	84.1915 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2059.0388 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2308.1825 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	121.4833 (310b)
Electricity used for heat distribution	41.1350 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	170.9800 (330a)
Total electricity for the above, kWh/year	170.9800 (331)
Electricity for lighting (calculated in Appendix L)	323.3395 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	4607.8157 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1563.1286	0.5190	811.2637 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	207.7523	0.5190	107.8235 (368)
Electrical energy for heat distribution	41.1350	0.5190	21.3490 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			940.4362 (373)
Space and water heating			940.4362 (376)
Pumps and fans	170.9800	0.5190	88.7386 (378)
Energy for lighting	323.3395	0.5190	167.8132 (379)
Energy saving/generation technologies			
PV Unit	-454.0100	0.5190	-235.6312 (380)
Total CO2, kg/year			961.3568 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			13.0800 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		13.0800 ZC1
Total Floor Area	TFA	73.5200
Assumed number of occupants	N	2.3285
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.5530 ZC2
CO2 emissions from cooking, equation (L16)		2.3787 ZC3
Total CO2 emissions		32.0117 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		32.0117 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1632 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4132 (18)
					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3512 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4478	0.4390	0.4303	0.3864	0.3776	0.3337	0.3337	0.3249	0.3512	0.3776	0.3951	0.4127 (22b)
	0.6003	0.5964	0.5926	0.5746	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			16.4900	1.3258	21.8617		(27)
External Wall	52.9500	16.4900	36.4600	0.1800	6.5628		(29a)
Corridor	5.4000	1.8900	3.5100	0.1800	0.6318		(29a)
Main Roof	73.5200		73.5200	0.1300	9.5576		(30)
Total net area of external elements Aum(A, m ²)			131.8700				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 40.5039		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.9698 (36)
Total fabric heat loss							(33) + (36) = 49.4737 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.4091	36.1729	35.9414	34.8541	34.6506	33.7036	33.7036	33.5282	34.0684	34.6506	35.0622	35.4924 (38)
Heat transfer coeff	85.8828	85.6466	85.4152	84.3278	84.1244	83.1773	83.1773	83.0020	83.5421	84.1244	84.5359	84.9662 (39)
Average = Sum(39)m / 12 =												84.3268 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1682	1.1649	1.1618	1.1470	1.1442	1.1314	1.1314	1.1290	1.1363	1.1442	1.1498	1.1557 (40)
HLP (average)												1.1470 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy content (annual)	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1408.1991 (45)
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
Heat gains from water heating, kWh/month	85.8210	76.1264	81.0886	74.2704	73.9268	67.7004	66.5829	70.9061	70.1053	76.9367	79.3664	84.2892 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3070	16.2601	13.2236	10.0111	7.4834	6.3178	6.8266	8.8735	11.9100	15.1225	17.6502	18.8158 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385 (71)
Water heating gains (Table 5)	115.3508	113.2833	108.9900	103.1533	99.3640	94.0283	89.4931	95.3039	97.3685	103.4096	110.2311	113.2919 (72)
Total internal gains	399.9539	397.9707	385.2706	364.7888	344.0400	323.9750	310.8872	316.6137	327.0851	347.7714	371.5522	389.3425 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Southeast				5.2100	36.7938	0.6300	0.7000	0.7700	58.5847 (77)			
South				1.8400	46.7521	0.6300	0.7000	0.7700	26.2900 (78)			
Southwest				7.8000	36.7938	0.6300	0.7000	0.7700	87.7085 (79)			
West				1.6400	19.6403	0.6300	0.7000	0.7700	9.8438 (80)			
Solar gains	182.4270	311.5043	427.5134	530.6984	594.4675	589.9567	568.8863	521.4963	463.3582	344.6994	218.6622	156.0085 (83)
Total gains	582.3809	709.4749	812.7841	895.4872	938.5075	913.9316	879.7735	838.1100	790.4433	692.4707	590.2145	545.3510 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	59.4479	59.6119	59.7734	60.5441	60.6906	61.3816	61.3816	61.5113	61.1135	60.6906	60.3951	60.0893	
alpha	4.9632	4.9741	4.9849	5.0363	5.0460	5.0921	5.0921	5.1008	5.0742	5.0460	5.0263	5.0060	
util living area	0.9932	0.9818	0.9542	0.8837	0.7506	0.5664	0.4132	0.4510	0.6826	0.9153	0.9841	0.9950 (86)	
MIT	19.9104	20.1308	20.4099	20.7073	20.9004	20.9811	20.9968	20.9951	20.9528	20.6918	20.2409	19.8709 (87)	
Th 2	19.9456	19.9481	19.9507	19.9626	19.9649	19.9753	19.9753	19.9772	19.9713	19.9649	19.9603	19.9556 (88)	
util rest of house	0.9910	0.9763	0.9404	0.8509	0.6903	0.4826	0.3185	0.3531	0.5984	0.8834	0.9782	0.9934 (89)	
MIT 2	18.5161	18.8357	19.2327	19.6427	19.8761	19.9639	19.9742	19.9754	19.9385	19.6351	19.0065	18.4661 (90)	
Living area fraction									fLA = Living area / (4) =			0.3678 (91)	
MIT	19.0289	19.3120	19.6657	20.0342	20.2528	20.3380	20.3503	20.3505	20.3115	20.0237	19.4605	18.9827 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.0289	19.3120	19.6657	20.0342	20.2528	20.3380	20.3503	20.3505	20.3115	20.0237	19.4605	18.9827 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	575.6262	689.5468	760.6539	764.2527	664.5579	468.7698	310.9159	326.2264	496.0837	613.2181	575.1866	540.5815 (95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W	1264.9592	1234.3410	1124.5468	938.9269	719.5026	477.2745	311.9433	327.8964	518.9245	792.7668	1044.9078	1256.0330 (97)	
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)	
Space heating kWh	512.8638	366.1017	270.7364	125.7655	40.8788	0.0000	0.0000	0.0000	0.0000	133.5842	338.1992	532.2959 (98)	
Space heating												2320.4255 (98)	
Space heating per m2												31.5618 (99)	

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												2481.7385 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	512.8638	366.1017	270.7364	125.7655	40.8788	0.0000	0.0000	0.0000	0.0000	133.5842	338.1992	532.2959 (98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000 (210)
Space heating fuel (main heating system)	548.5174	391.5527	289.5576	134.5085	43.7206	0.0000	0.0000	0.0000	0.0000	142.8708	361.7104	569.3004 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
Efficiency of water heater (217)m	87.3041	86.8121	85.9243	84.1807	81.7997	79.8000	79.8000	79.8000	79.8000	84.2431	86.5388	79.8000 (216)
Fuel for water heating, kWh/month	220.6024	195.5699	207.5807	190.0314	191.7158	175.7022	168.8423	185.1357	184.7660	196.9011	202.5635	214.9910 (219)
Water heating fuel used												2334.4022 (219)
Annual totals kWh/year												
Space heating fuel - main system												2481.7385 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												323.3067 (232)
Total delivered energy for all uses												5214.4474 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2481.7385	0.2160	536.0555 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2334.4022	0.2160	504.2309 (264)
Space and water heating			1040.2864 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	323.3067	0.5190	167.7962 (268)
Total CO2, kg/m2/year			1247.0076 (272)
Emissions per m2 for space and water heating			14.1497 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.2823 (272b)
Emissions per m2 for pumps and fans			0.5294 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.1497 * 1.55) + 2.2823 + 0.5294, rounded to 2 d.p.			24.7400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010562			Issued on Date	29/04/2022
Assessment Reference	135	Prop Type Ref			
Property					
SAP Rating	83 B	DER	12.44	TER	25.79
Environmental	92 A	% DER<TER	51.76		
CO ₂ Emissions (t/year)	0.52	DFEE	35.11	TFEE	38.56
General Requirements Compliance	Fail	% DFEE<TFEE	8.96		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)

Fuel factor: 1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 25.79 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.44 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 38.6 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 35.1 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room stats OK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing South East:	6.24 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Windows facing South West:	1.97 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	454.01 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

					main	secondary	other			total	m3 per hour	
					heating		heating					
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Air changes per hour												
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =										0.0000 / (5) =	0.0000 (8)	
Pressure test												
Measured/design AP50												
Infiltration rate												
Number of sides sheltered												
Shelter factor										(20) = 1 - [0.075 x (19)] =	0.8500 (20)	
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =	0.1275 (21)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			10.4200	1.1450	11.9313		(27)					
External Wall	39.3500	10.4200	28.9300	0.1500	4.3395		(29a)					
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)					
Total net area of external elements Aum(A, m2)			56.8500				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	22.0633		(33)					
Party Wall 1			17.5500	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												
Total fabric heat loss						(33) + (36) =	29.3233 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 11.7351	Feb 11.6015	Mar 11.4680	Apr 10.8002	May 10.6666	Jun 9.9988	Jul 9.9988	Aug 9.8652	Sep 10.2659	Oct 10.6666	Nov 10.9337	Dec 11.2009 (38)
Heat transfer coeff	41.0584	40.9248	40.7913	40.1235	39.9899	39.3221	39.3221	39.1885	39.5892	39.9899	40.2570	40.5242 (39)
Average = Sum(39)m / 12 =												40.0901 (39)
HLP	Jan 0.8084	Feb 0.8058	Mar 0.8031	Apr 0.7900	May 0.7874	Jun 0.7742	Jul 0.7742	Aug 0.7716	Sep 0.7795	Oct 0.7874	Nov 0.7926	Dec 0.7979 (40)
HLP (average)												0.7893 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan 82.3820	Feb 79.3863	Mar 76.3906	Apr 73.3949	May 70.3992	Jun 67.4035	Jul 67.4035	Aug 70.3992	Sep 73.3949	Oct 76.3906	Nov 79.3863	Dec 82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												

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Store volume													110.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	30.9817	(56)
If cylinder contains dedicated solar storage													
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	30.9817	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	(59)
Total heat required for water heating calculated for each month													
177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	173.5921	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =													(63)
Output from w/h													
177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	173.5921	(64)
Heat gains from water heating, kWh/month													
84.8430	75.4698	80.8830	74.7574	74.8902	69.2597	68.7450	72.3625	71.2721	77.4089	79.0216	83.5613	83.5613	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
13.3089	11.8209	9.6134	7.2779	5.4403	4.5930	4.9629	6.4509	8.6584	10.9938	12.8314	13.6788	13.6788	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)													
114.0363	112.3063	108.7138	103.8297	100.6589	96.1941	92.3992	97.2615	98.9891	104.0442	109.7522	112.3135	112.3135	(72)
Total internal gains													
325.3314	323.6625	313.9587	298.4287	282.9297	267.7578	257.7459	262.5472	270.3860	286.0871	304.1233	317.3917	317.3917	(73)

6. Solar gains

[Jan]													
	Area	Solar flux	g	Specific data	FF	Access	Gains						
	m2	Table 6a	W/m2	or Table 6b	Specific data	factor	W						
					or Table 6c	Table 6d							
Southeast	6.2400	36.7938	0.4000		0.8000	0.7700	50.9147	(77)					
South	2.2100	46.7521	0.4000		0.8000	0.7700	22.9127	(78)					
Southwest	1.9700	36.7938	0.4000		0.8000	0.7700	16.0740	(79)					
Solar gains	89.9014	151.6316	203.9258	247.4718	272.9739	269.2882	260.3244	241.4662	218.9840	166.5863	107.3964	77.1270	(83)
Total gains	415.2328	475.2941	517.8846	545.9005	555.9036	537.0461	518.0703	504.0134	489.3700	452.6734	411.5197	394.5187	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	85.9040	86.1844	86.4666	87.9057	88.1993	89.6972	89.6972	90.0029	89.0920	88.1993	87.6141	87.0366	
alpha	6.7269	6.7456	6.7644	6.8604	6.8800	6.9798	6.9798	7.0002	6.9395	6.8800	6.8409	6.8024	
util living area	0.9862	0.9666	0.9213	0.8162	0.6545	0.4673	0.3339	0.3575	0.5538	0.8332	0.9645	0.9896	(86)
MIT	20.4554	20.6064	20.7743	20.9210	20.9840	20.9987	20.9999	20.9998	20.9958	20.9233	20.6783	20.4262	(87)
Th 2	20.2461	20.2483	20.2506	20.2620	20.2643	20.2757	20.2757	20.2780	20.2712	20.2643	20.2597	20.2552	(88)
util rest of house													
	0.9824	0.9581	0.9032	0.7823	0.6075	0.4150	0.2790	0.3015	0.4972	0.7947	0.9540	0.9866	(89)
MIT 2	19.5333	19.7491	19.9813	20.1785	20.2504	20.2749	20.2757	20.2780	20.2683	20.1868	19.8623	19.4988	(90)
Living area fraction													
MIT	19.9970	20.1802	20.3801	20.5519	20.6193	20.6389	20.6399	20.6410	20.6341	20.5572	20.2726	19.9651	(91)
Temperature adjustment												0.0000	
adjusted MIT	19.9970	20.1802	20.3801	20.5519	20.6193	20.6389	20.6399	20.6410	20.6341	20.5572	20.2726	19.9651	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9809	0.9572	0.9066	0.7961	0.6304	0.4413	0.3066	0.3297	0.5256	0.8107	0.9542	0.9853	(94)
Useful gains	407.2926	454.9457	469.5068	434.6035	350.4570	237.0148	158.8272	166.1496	257.2094	367.0020	392.6747	388.6999	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
644.4942	625.3415	566.1862	467.5134	356.6811	237.4604	158.8559	166.1969	258.6802	398.1858	530.2911	638.8693	638.8693	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
176.4780	114.5060	71.9295	23.6952	4.6308	0.0000	0.0000	0.0000	0.0000	23.2007	99.0838	186.1261	186.1261	(98)
Space heating													
Space heating per m2													
													(98) / (4) = 13.7753 (99)

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8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	699.6500 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	784.3076 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	41.2793 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2050.5266 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	107.9225 (310b)
Electricity used for heat distribution	29.8404 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	235.0396 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	3341.0669 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1133.9337	0.5190	588.5116 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	150.7089	0.5190	78.2179 (368)
Electrical energy for heat distribution	29.8404	0.5190	15.4871 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			682.2167 (373)
Space and water heating			682.2167 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	235.0396	0.5190	121.9856 (379)
Energy saving/generation technologies			
PV Unit	-454.0100	0.5190	-235.6312 (380)
Total CO2, kg/year			631.8845 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			12.4400 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		12.4400 ZC1
Total Floor Area	TFA	50.7900
Assumed number of occupants	N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.4175 ZC2
CO2 emissions from cooking, equation (L16)		3.1526 ZC3
Total CO2 emissions		33.0101 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		33.0101 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 20.0000 / (5) = 0.1575 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4075 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3464 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4416	0.4330	0.4243	0.3810	0.3724	0.3291	0.3291	0.3204	0.3464	0.3724	0.3897	0.4070 (22b)
Effective ac	0.5975	0.5937	0.5900	0.5726	0.5693	0.5541	0.5541	0.5513	0.5600	0.5693	0.5759	0.5828 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900		(26)					
TER Opening Type (Uw = 1.40)			10.4200	1.3258	13.8144		(27)					
External Wall	39.3500	10.4200	28.9300	0.1800	5.2074		(29a)					
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)					
Total net area of external elements Aum(A, m2)			56.8500				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.7216		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.5976 (36)					
Total fabric heat loss						(33) + (36) =	29.3192 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	25.0373	24.8786	24.7230	23.9925	23.8558	23.2195	23.2195	23.1017	23.4646	23.8558	24.1323	24.4214 (38)
Heat transfer coeff	54.3565	54.1978	54.0422	53.3117	53.1750	52.5387	52.5387	52.4209	52.7838	53.1750	53.4515	53.7406 (39)
Average = Sum(39)m / 12 =												53.3110 (39)
HLP	1.0702	1.0671	1.0640	1.0496	1.0470	1.0344	1.0344	1.0321	1.0393	1.0470	1.0524	1.0581 (40)
HLP (average)												1.0496 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

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If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.3700	11.8751	9.6575	7.3113	5.4653	4.6140	4.9856	6.4805	8.6981	11.0443	12.8903	13.7416	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	(71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782	(72)
Total internal gains	319.0571	317.3814	307.6675	292.1267	276.6192	261.4435	251.4333	256.2414	264.0903	279.8021	297.8468	311.1191	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Southeast				6.2400	36.7938	0.6300	0.7000	0.7700	70.1668 (77)			
South				2.2100	46.7521	0.6300	0.7000	0.7700	31.5766 (78)			
Southwest				1.9700	36.7938	0.6300	0.7000	0.7700	22.1520 (79)			
Solar gains	123.8953	208.9673	281.0353	341.0471	376.1922	371.1129	358.7596	332.7706	301.7873	229.5768	148.0056	106.2907 (83)
Total gains	442.9525	526.3487	588.7027	633.1738	652.8114	632.5564	610.1929	589.0120	565.8776	509.3789	445.8524	417.4098 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	64.8880	65.0780	65.2653	66.1597	66.3297	67.1330	67.1330	67.2839	66.8213	66.3297	65.9866	65.6316	
alpha	5.3259	5.3385	5.3510	5.4106	5.4220	5.4755	5.4755	5.4856	5.4548	5.4220	5.3991	5.3754	
util living area	0.9887	0.9722	0.9357	0.8518	0.7085	0.5236	0.3777	0.4076	0.6216	0.8768	0.9736	0.9914	(86)
MIT	20.1184	20.3225	20.5628	20.8008	20.9397	20.9905	20.9987	20.9980	20.9765	20.7995	20.4185	20.0804	(87)
Th 2	20.0252	20.0278	20.0303	20.0422	20.0444	20.0547	20.0547	20.0567	20.0507	20.0444	20.0399	20.0352	(88)
util rest of house	0.9852	0.9642	0.9183	0.8159	0.6504	0.4498	0.2972	0.3250	0.5449	0.8382	0.9647	0.9888	(89)
MIT 2	18.8755	19.1689	19.5059	19.8286	19.9916	20.0490	20.0543	20.0559	20.0348	19.8368	19.3187	18.8281	(90)
Living area fraction	19.5005	19.7489	20.0373	20.3175	20.4684	20.5224	20.5292	20.5296	20.5083	20.3209	19.8717	19.4578	(91)
MIT	19.5005	19.7489	20.0373	20.3175	20.4684	20.5224	20.5292	20.5296	20.5083	20.3209	19.8717	19.4578	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5005	19.7489	20.0373	20.3175	20.4684	20.5224	20.5292	20.5296	20.5083	20.3209	19.8717	19.4578	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	435.3792	506.1019	540.6757	523.5667	441.9757	307.8751	206.0715	215.9135	329.7317	433.1813	429.2618	411.8986	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	826.2463	804.7800	731.5873	608.6836	466.2587	311.1577	206.4334	216.4791	338.2567	516.9074	682.6690	819.9635	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	290.8052	200.7117	142.0383	61.2841	18.0665	0.0000	0.0000	0.0000	0.0000	62.2922	182.4532	303.6003	(98)
Space heating												1261.2515	(98)
Space heating per m2												24.8327	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1348.9321 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	290.8052	200.7117	142.0383	61.2841	18.0665	0.0000	0.0000	0.0000	0.0000	62.2922	182.4532	303.6003	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	311.0216	214.6649	151.9126	65.5445	19.3225	0.0000	0.0000	0.0000	0.0000	66.6227	195.1371	324.7062	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	86.2530	85.6104	84.5505	82.7613	80.9014	79.8000	79.8000	79.8000	79.8000	82.7191	85.2662	79.8000	(216)
Fuel for water heating, kWh/month	195.6629	173.9702	185.5167	170.6349	171.6061	156.2471	150.8144	164.4484	163.8315	176.9926	180.6628	190.8214	(219)
Water heating fuel used												2081.2089	(219)
Annual totals kWh/year													
Space heating fuel - main system												1348.9321	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												236.1179	(232)
Total delivered energy for all uses												3741.2589	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1348.9321	0.2160	291.3693 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2081.2089	0.2160	449.5411 (264)
Space and water heating			740.9105 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	236.1179	0.5190	122.5452 (268)
Total CO2, kg/m2/year			902.3806 (272)
Emissions per m2 for space and water heating			14.5877 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4128 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.5877 * 1.55) + 2.4128 + 0.7664, rounded to 2 d.p.			25.7900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010563			Issued on Date	29/04/2022
Assessment Reference	136	Prop Type Ref			
Property					
SAP Rating	82 B	DER	15.00	TER	28.07
Environmental	89 B	% DER<TER	46.57		
CO ₂ Emissions (t/year)	0.84	DFEE	47.30	TFEE	55.17
General Requirements Compliance	Pass	% DFEE<TFEE	14.26		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 73 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 28.07 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.00 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)55.2 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)47.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.61	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading:	Average
Windows facing North:	5.88 m ² , No overhang
Windows facing North West:	7.07 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	454.01 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500	(18)				
Number of sides sheltered							2	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1275 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												75.6500 (23c)
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Door			1.8900	1.0000	1.8900		(26)					
Window (Uw = 1.20)			12.9500	1.1450	14.8282		(27)					
External Wall	35.0800	12.9500	22.1300	0.1500	3.3195		(29a)					
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)					
Core	18.2300		18.2300	0.2500	4.5575		(29a)					
Main Roof	72.7700		72.7700	0.1000	7.2770		(30)					
Total net area of external elements Aum(A, m2)			143.5800				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		35.7747		(33)					
Party Wall 1			18.3000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.2124 (36)					
Total fabric heat loss							(33) + (36) = 45.9871 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 17.0688	Feb 16.8774	Mar 16.6860	Apr 15.7292	May 15.5379	Jun 14.5811	Jul 14.5811	Aug 14.3897	Sep 14.9638	Oct 15.5379	Nov 15.9206	Dec 16.3033 (38)
Heat transfer coeff	63.0559	62.8646	62.6732	61.7164	61.5250	60.5682	60.5682	60.3768	60.9509	61.5250	61.9077	62.2905 (39)
Average = Sum(39)m / 12 =	61.6685 (39)											
HLP	Jan 0.8665	Feb 0.8639	Mar 0.8613	Apr 0.8481	May 0.8455	Jun 0.8323	Jul 0.8323	Aug 0.8297	Sep 0.8376	Oct 0.8455	Nov 0.8507	Dec 0.8560 (40)
HLP (average)	0.8474 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	Jan 98.0067	Feb 94.4428	Mar 90.8789	Apr 87.3151	May 83.7512	Jun 80.1873	Jul 80.1873	Aug 83.7512	Sep 87.3151	Oct 90.8789	Nov 94.4428	Dec 98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)												Total = Sum(45)m = 1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)
Water storage loss:												
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage												
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h												
200.6179	177.0437	186.4494	167.8531	165.0074	148.1828	143.0202	155.9637	155.3831	174.0191	183.1101	196.0319	(64)
Heat gains from water heating, kWh/month												
92.5474	82.2081	87.8363	80.8195	80.7069	74.2791	73.3961	77.6998	76.6732	83.7032	85.8924	91.0225	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	115.5726	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
18.2553	16.2142	13.1863	9.9829	7.4623	6.3000	6.8074	8.8485	11.8764	15.0798	17.6004	18.7627	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
203.6738	205.7873	200.4614	189.1231	174.8105	161.3587	152.3721	150.2586	155.5845	166.9228	181.2354	194.6872	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	34.5573	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	-92.4581	(71)
Water heating gains (Table 5)												
124.3916	122.3335	118.0596	112.2492	108.4770	103.1654	98.6507	104.4353	106.4905	112.5044	119.2950	122.3421	(72)
Total internal gains												
403.9925	402.0068	389.3790	369.0270	348.4216	328.4959	315.5019	321.2141	331.6232	352.1788	375.8026	393.4637	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				5.8800	10.6334	0.4000	0.8000	0.7700	13.8654 (74)			
Northwest				7.0700	11.2829	0.4000	0.8000	0.7700	17.6899 (81)			

Solar gains	31.5553	62.5058	109.9012	178.8670	240.6417	256.9805	240.2068	191.1218	133.1872	75.5468	39.3632	26.0053 (83)
Total gains	435.5478	464.5125	499.2802	547.8939	589.0632	585.4764	555.7088	512.3359	464.8104	427.7255	415.1658	419.4691 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.1427	80.3867	80.6321	81.8822	82.1369	83.4344	83.4344	83.6988	82.9105	82.1369	81.6291	81.1275	
alpha	6.3428	6.3591	6.3755	6.4588	6.4758	6.5623	6.5623	6.5799	6.5274	6.4758	6.4419	6.4085	
util living area	0.9978	0.9962	0.9900	0.9600	0.8533	0.6465	0.4776	0.5376	0.8201	0.9743	0.9952	0.9983 (86)	
MIT	20.1584	20.2520	20.4354	20.6985	20.9050	20.9875	20.9985	20.9969	20.9461	20.6951	20.3894	20.1440 (87)	
Th 2	20.1961	20.1983	20.2006	20.2118	20.2141	20.2254	20.2254	20.2277	20.2209	20.2141	20.2096	20.2051 (88)	
util rest of house	0.9971	0.9949	0.9866	0.9462	0.8104	0.5749	0.3946	0.4498	0.7560	0.9628	0.9934	0.9977 (89)	
MIT 2	19.0639	19.2021	19.4701	19.8524	20.1212	20.2171	20.2248	20.2263	20.1774	19.8545	19.4116	19.0498 (90)	
Living area fraction									fLA = Living area / (4) =				0.3846 (91)
MIT	19.4849	19.6059	19.8414	20.1778	20.4227	20.5134	20.5224	20.5227	20.4731	20.1778	19.7877	19.4707 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.4849	19.6059	19.8414	20.1778	20.4227	20.5134	20.5224	20.5227	20.4731	20.1778	19.7877	19.4707 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9963	0.9937	0.9846	0.9455	0.8227	0.6021	0.4266	0.4837	0.7783	0.9621	0.9922	0.9971	(94)
Useful gains	433.9373	461.5895	491.5960	518.0235	484.6082	352.4973	237.0559	247.8034	361.7563	411.5249	411.9177	418.2320	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
	957.4952	924.4807	836.1487	696.0249	536.6613	358.1638	237.5717	248.9156	388.4460	589.2752	785.4672	951.2177	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	389.5271	311.0629	256.3472	128.1610	38.7275	0.0000	0.0000	0.0000	0.0000	132.2462	268.9557	396.5414	(98)
Space heating													
Space heating per m2												1921.5691	(99)
										(98) / (4) =		26.4061	(99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1921.5691 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	2154.0789 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	113.3726 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2052.6825 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2301.0570 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	121.1083 (310b)
Electricity used for heat distribution	46.8962 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	169.2357 (330a)
Total electricity for the above, kWh/year	169.2357 (331)
Electricity for lighting (calculated in Appendix L)	322.3944 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	5181.2469 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1782.0544	0.5190	924.8862 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	236.8493	0.5190	122.9248 (368)
Electrical energy for heat distribution	46.8962	0.5190	24.3391 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1072.1501 (373)
Space and water heating			1072.1501 (376)
Pumps and fans	169.2357	0.5190	87.8333 (378)
Energy for lighting	322.3944	0.5190	167.3227 (379)
Energy saving/generation technologies			
PV Unit	-454.0100	0.5190	-235.6312 (380)
Total CO2, kg/year			1091.6750 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.0000 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		15.0000 ZC1
Total Floor Area	TFA	72.7700
Assumed number of occupants	N	2.3115
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.5855 ZC2
CO2 emissions from cooking, equation (L16)		2.3976 ZC3
Total CO2 emissions		33.9831 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		33.9831 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.7700 (1b)	x 2.5000 (2b)	= 181.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.7700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.9250 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1649 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4149 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3527 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4497	0.4408	0.4320	0.3879	0.3791	0.3350	0.3350	0.3262	0.3527	0.3791	0.3968	0.4144 (22b)
Effective ac	0.6011	0.5972	0.5933	0.5752	0.5719	0.5561	0.5561	0.5532	0.5622	0.5719	0.5787	0.5859 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8900	1.0000	1.8900			(26)				
TER Opening Type (Uw = 1.40)			12.9500	1.3258	17.1686			(27)				
External Wall	35.0800	12.9500	22.1300	0.1800	3.9834			(29a)				
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098			(29a)				
Core	18.2300		18.2300	0.1800	3.2814			(29a)				
Main Roof	72.7700		72.7700	0.1300	9.4601			(30)				
Total net area of external elements Aum(A, m2)			143.5800					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	38.5933			(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								8.0924 (36)				
Total fabric heat loss						(33) + (36) =		46.6857 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 36.0868	Feb 35.8511	Mar 35.6201	Apr 34.5351	May 34.3321	Jun 33.3870	Jul 33.3870	Aug 33.2120	Sep 33.7511	Oct 34.3321	Nov 34.7427	Dec 35.1721 (38)
Heat transfer coeff	82.7724	82.5368	82.3058	81.2207	81.0177	80.0727	80.0727	79.8977	80.4367	81.0177	81.4284	81.8577 (39)
Average = Sum(39)m / 12 =												81.2198 (39)
HLP	Jan 1.1375	Feb 1.1342	Mar 1.1310	Apr 1.1161	May 1.1133	Jun 1.1004	Jul 1.1004	Aug 1.0979	Sep 1.1054	Oct 1.1133	Nov 1.1190	Dec 1.1249 (40)
HLP (average)												1.1161 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3115 (42)
Average daily hot water use (litres/day)												89.0970 (43)
Daily hot water use	98.0067	94.4428	90.8789	87.3151	83.7512	80.1873	80.1873	83.7512	87.3151	90.8789	94.4428	98.0067 (44)
Energy conte	145.3411	127.1163	131.1726	114.3594	109.7306	94.6892	87.7434	100.6869	101.8894	118.7423	129.6165	140.7551 (45)
Energy content (annual)										Total = Sum(45)m =		1401.8427 (45)
Distribution loss (46)m = 0.15 x (45)m												
21.8012	19.0674	19.6759	17.1539	16.4596	14.2034	13.1615	15.1030	15.2834	17.8113	19.4425	21.1133 (46)	
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)

Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) =	Sum(63)m =	0.0000	0.0000	0.0000 (63)
Output from w/h	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500 (64)
								Total per year (kWh/year) =	Sum(64)m =	1950.4601	1950.4601	1950.4601 (64)
Heat gains from water heating, kWh/month	85.6018	75.9347	80.8908	74.0980	73.7613	67.5576	66.4506	70.7543	69.9517	76.7577	79.1709	84.0770 (65)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3166.3081 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	571.8527	463.1994	395.8565	221.1776	86.9065	0.0000	0.0000	0.0000	0.0000	229.8674	411.4455	580.1925	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	611.6072	495.4004	423.3760	236.5536	92.9481	0.0000	0.0000	0.0000	0.0000	245.8475	440.0486	620.5267	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	191.9360	169.2020	177.7675	159.4513	156.3255	139.7810	134.3383	147.2818	146.9812	165.3372	174.7083	187.3500	(64)
Efficiency of water heater (217)m	87.5500	87.3657	86.8895	85.6869	83.3198	79.8000	79.8000	79.8000	79.8000	85.6930	87.0221	87.6319	(216)
Fuel for water heating, kWh/month	219.2301	193.6708	204.5904	186.0859	187.6211	175.1642	168.3438	184.5636	184.1870	192.9413	200.7631	213.7920	(219)
Water heating fuel used												2310.9534	(219)
Annual totals kWh/year													
Space heating fuel - main system												3166.3081	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												328.1242	(232)
Total delivered energy for all uses												5880.3857	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3166.3081	0.2160	683.9226 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2310.9534	0.2160	499.1659 (264)
Space and water heating			1183.0885 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	328.1242	0.5190	170.2965 (268)
Total CO2, kg/m2/year			1392.3100 (272)
Emissions per m2 for space and water heating			16.2579 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3402 (272b)
Emissions per m2 for pumps and fans			0.5349 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.2579 * 1.55) + 2.3402 + 0.5349, rounded to 2 d.p.			28.0700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010564			Issued on Date	29/04/2022
Assessment Reference	137	Prop Type Ref			
Property					
SAP Rating	83 B	DER	13.68	TER	26.12
Environmental	90 B	% DER<TER	47.64		
CO ₂ Emissions (t/year)	0.79	DFEE	42.21	TFEE	49.77
General Requirements Compliance	Fail	% DFEE<TFEE	15.20		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aecom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 74 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 26.12 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.68 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)49.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)42.2 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.18 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading: Average
Windows facing North: 1.97 m², No overhang
Windows facing North East: 6.47 m², No overhang
Windows facing East: 2.21 m², No overhang
Windows facing South East: 6.24 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 454.01 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												75.6500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2843	0.2811	0.2779	0.2620	0.2588	0.2429	0.2429	0.2397	0.2493	0.2588	0.2652	0.2716 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Door			1.8900	1.0000	1.8900		(26)	
Window (Uw = 1.20)			16.8900	1.1450	19.3397		(27)	
External Wall	49.6500	16.8900	32.7600	0.1500	4.9140		(29a)	
Corridor	4.5800	1.8900	2.6900	0.2500	0.6725		(29a)	
Main Roof	73.5200		73.5200	0.1000	7.3520		(30)	
Total net area of external elements Aum(A, m2)			127.7500				(31)	
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		34.1682		(33)	
Party Wall 1			38.0500	0.0000	0.0000		(32)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								11.8310 (36)
Total fabric heat loss						(33) + (36) =	45.9992 (37)	

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	17.2447	17.0514	16.8580	15.8913	15.6980	14.7313	14.7313	14.5380	15.1180	15.6980	16.0847	16.4714 (38)
Average = Sum(39)m / 12 =	63.2439	63.0506	62.8572	61.8905	61.6972	60.7305	60.7305	60.5372	61.1172	61.6972	62.0839	62.4705 (39)
	63.2439	63.0506	62.8572	61.8905	61.6972	60.7305	60.7305	60.5372	61.1172	61.6972	62.0839	61.8422 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8602	0.8576	0.8550	0.8418	0.8392	0.8260	0.8260	0.8234	0.8313	0.8392	0.8444	0.8497 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3285 (42)
Average daily hot water use (litres/day)													89.5010 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)	
Energy conte	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)	
Energy content (annual)													Total = Sum(45)m = 1408.1991 (45)
Distribution loss (46)m = 0.15 x (45)m	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)	

Water storage loss:													110.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152 (51)
Volume factor from Table 2a													1.0294 (52)
Temperature factor from Table 2b													0.6000 (53)
Enter (49) or (54) in (55)													1.0327 (55)
Total storage loss													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)
If cylinder contains dedicated solar storage													
	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	201.2769	177.6201	187.0442	168.3717	165.5050	148.6122	143.4181	156.4202	155.8451	174.5575	183.6979	196.6701	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
	Solar input (sum of months) = Sum (63)m =											0.0000 (63)	
Output from w/h													
	201.2769	177.6201	187.0442	168.3717	165.5050	148.6122	143.4181	156.4202	155.8451	174.5575	183.6979	196.6701	(64)
	Total per year (kWh/year) = Sum (64)m =											2059.0388 (64)	
Heat gains from water heating, kWh/month													
	92.7665	82.3997	88.0341	80.9919	80.8723	74.4219	73.5284	77.8516	76.8268	83.8823	86.0878	91.2347	(65)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

----- 9b. Energy requirements -----

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1592.7645 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1785.4890 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	93.9731 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	2059.0388 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2308.1825 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	121.4833 (310b)
Electricity used for heat distribution	43.0913 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)	
mechanical ventilation fans (SFP = 0.7625)	170.9800 (330a)
Total electricity for the above, kWh/year	170.9800 (331)
Electricity for lighting (calculated in Appendix L)	323.3395 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	4803.4474 (338)

----- 12b. Carbon dioxide emissions - Community heating scheme -----

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1637.4686	0.5190	849.8462 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	217.6327	0.5190	112.9514 (368)
Electrical energy for heat distribution	43.0913	0.5190	22.3644 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			985.1620 (373)
Space and water heating			985.1620 (376)
Pumps and fans	170.9800	0.5190	88.7386 (378)
Energy for lighting	323.3395	0.5190	167.8132 (379)
Energy saving/generation technologies			
PV Unit	-454.0100	0.5190	-235.6312 (380)
Total CO2, kg/year			1006.0826 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			13.6800 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES DER

Total Floor Area	TFA	13.6800 ZC1
Assumed number of occupants	N	73.5200
CO2 emission factor in Table 12 for electricity displaced from grid	EF	2.3285
CO2 emissions from appliances, equation (L14)		0.5190
CO2 emissions from cooking, equation (L16)		16.5530 ZC2
Total CO2 emissions		2.3787 ZC3
Residual CO2 emissions offset from biofuel CHP		32.6117 ZC4
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC5
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC6
Net CO2 emissions		0.0000 ZC7
		32.6117 ZC8

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	73.5200 (1b)	x 2.5000 (2b)	= 183.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.5200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 183.8000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					30.0000 / (5) = 0.1632 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4132 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3512 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4478	0.4390	0.4303	0.3864	0.3776	0.3337	0.3337	0.3249	0.3512	0.3776	0.3951	0.4127 (22b)
	0.6003	0.5964	0.5926	0.5746	0.5713	0.5557	0.5557	0.5528	0.5617	0.5713	0.5781	0.5852 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			16.4900	1.3258	21.8617		(27)
External Wall	49.6500	16.4900	33.1600	0.1800	5.9688		(29a)
Corridor	4.5800	1.8900	2.6900	0.1800	0.4842		(29a)
Main Roof	73.5200		73.5200	0.1300	9.5576		(30)
Total net area of external elements Aum(A, m ²)			127.7500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		39.7623		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.5999 (36)
Total fabric heat loss						(33) + (36) =	48.3622 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.4091	36.1729	35.9414	34.8541	34.6506	33.7036	33.7036	33.5282	34.0684	34.6506	35.0622	35.4924 (38)
Heat transfer coeff	84.7713	84.5351	84.3037	83.2163	83.0129	82.0658	82.0658	81.8905	82.4306	83.0129	83.4244	83.8547 (39)
Average = Sum(39)m / 12 =												83.2153 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1530	1.1498	1.1467	1.1319	1.1291	1.1162	1.1162	1.1139	1.1212	1.1291	1.1347	1.1406 (40)
HLP (average)												1.1319 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3285 (42)
Average daily hot water use (litres/day)												89.5010 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	98.4511	94.8710	91.2910	87.7110	84.1309	80.5509	80.5509	84.1309	87.7110	91.2910	94.8710	98.4511 (44)
Energy content (annual)	146.0001	127.6926	131.7674	114.8780	110.2282	95.1185	88.1413	101.1434	102.3514	119.2807	130.2042	141.3933 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1408.1991 (45)
	21.9000	19.1539	19.7651	17.2317	16.5342	14.2678	13.2212	15.1715	15.3527	17.8921	19.5306	21.2090 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
Heat gains from water heating, kWh/month	85.8210	76.1264	81.0886	74.2704	73.9268	67.7004	66.5829	70.9061	70.1053	76.9367	79.3664	84.2892 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	116.4231	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3070	16.2601	13.2236	10.0111	7.4834	6.3178	6.8266	8.8735	11.9100	15.1225	17.6502	18.8158	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	205.3693	207.5004	202.1301	190.6974	176.2657	162.7019	153.6405	151.5094	156.8797	168.3123	182.7441	196.3078	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	34.6423	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	-93.1385	(71)
Water heating gains (Table 5)	115.3508	113.2833	108.9900	103.1533	99.3640	94.0283	89.4931	95.3039	97.3685	103.4096	110.2311	113.2919	(72)
Total internal gains	399.9539	397.9707	385.2706	364.7888	344.0400	323.9750	310.8872	316.6137	327.0851	347.7714	371.5522	389.3425	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d	Gains W		
North				1.9200	10.6334	0.6300	0.7000		0.7700	6.2394 (74)		
Northeast				6.3200	11.2829	0.6300	0.7000		0.7700	21.7927 (75)		
East				2.1600	19.6403	0.6300	0.7000		0.7700	12.9650 (76)		
Southeast				6.0900	36.7938	0.6300	0.7000		0.7700	68.4801 (77)		
Solar gains	109.4772	198.2928	301.5531	422.4704	516.4299	531.3511	504.5419	431.8290	343.1398	227.4190	133.3072	92.2650 (83)
Total gains	509.4312	596.2635	686.8237	787.2591	860.4699	855.3261	815.4291	748.4428	670.2249	575.1904	504.8594	481.6075 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.2274	60.3957	60.5615	61.3528	61.5032	62.2129	62.2129	62.3462	61.9376	61.5032	61.1998	60.8858	
alpha	5.0152	5.0264	5.0374	5.0902	5.1002	5.1475	5.1475	5.1564	5.1292	5.1002	5.0800	5.0591	
util living area	0.9962	0.9911	0.9752	0.9197	0.7876	0.5938	0.4391	0.4959	0.7614	0.9541	0.9917	0.9971	(86)
MIT	19.8405	20.0163	20.2937	20.6375	20.8791	20.9777	20.9961	20.9929	20.9249	20.5966	20.1559	19.8118	(87)
Th 2	19.9578	19.9603	19.9629	19.9749	19.9771	19.9876	19.9876	19.9895	19.9836	19.9771	19.9726	19.9678	(88)
util rest of house	0.9949	0.9881	0.9670	0.8940	0.7301	0.5084	0.3400	0.3908	0.6795	0.9337	0.9884	0.9962	(89)
MIT 2	18.4235	18.6807	19.0814	19.5661	19.8666	19.9739	19.9862	19.9868	19.9279	19.5239	18.8940	18.3889	(90)
Living area fraction									fLA = Living area / (4) =			0.3678	(91)
MIT	18.9447	19.1719	19.5273	19.9601	20.2390	20.3431	20.3576	20.3568	20.2946	19.9184	19.3581	18.9123	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9447	19.1719	19.5273	19.9601	20.2390	20.3431	20.3576	20.3568	20.2946	19.9184	19.3581	18.9123	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9932	0.9851	0.9626	0.8936	0.7459	0.5392	0.3766	0.4296	0.7064	0.9323	0.9858	0.9948	(94)
Useful gains	505.9666	587.4086	661.1294	703.5102	641.8261	461.2074	307.0859	321.5623	473.4763	536.2560	497.6762	479.0810	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1241.4474	1206.4763	1098.2479	920.3844	708.8440	471.3116	308.3742	324.0282	510.6249	773.5486	1022.6271	1233.6911	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	547.1977	416.0135	325.2162	156.1494	49.8613	0.0000	0.0000	0.0000	0.0000	176.5457	377.9647	561.4300	(98)
Space heating												2610.3784	(98)
Space heating per m2										(98) / (4) =		35.5057	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												93.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												2791.8486 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	547.1977	416.0135	325.2162	156.1494	49.8613	0.0000	0.0000	0.0000	0.0000	176.5457	377.9647	561.4300 (98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000 (210)
Space heating fuel (main heating system)	585.2382	444.9342	347.8248	167.0047	53.3276	0.0000	0.0000	0.0000	0.0000	188.8189	404.2403	600.4599 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	192.5950	169.7784	178.3623	159.9698	156.8231	140.2104	134.7362	147.7383	147.4432	165.8756	175.2960	187.9882 (64)
Efficiency of water heater (217)m	87.4474	87.1146	86.3969	84.7495	82.1429	79.8000	79.8000	79.8000	79.8000	84.9802	86.8119	79.8000 (216)
Fuel for water heating, kWh/month	220.2409	194.8908	206.4453	188.7561	190.9148	175.7022	168.8423	185.1357	184.7660	195.1931	201.9263	214.7084 (219)
Water heating fuel used												2327.5220 (219)
Annual totals kWh/year												
Space heating fuel - main system												2791.8486 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												323.3067 (232)
Total delivered energy for all uses												5517.6773 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2791.8486	0.2160	603.0393 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2327.5220	0.2160	502.7447 (264)
Space and water heating			1105.7840 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	323.3067	0.5190	167.7962 (268)
Total CO2, kg/m2/year			1312.5052 (272)
Emissions per m2 for space and water heating			15.0406 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.2823 (272b)
Emissions per m2 for pumps and fans			0.5294 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.0406 * 1.55) + 2.2823 + 0.5294, rounded to 2 d.p.			26.1200 (273)

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Calculation Type: New Build (As Designed)

Property Reference	010565			Issued on Date	29/04/2022
Assessment Reference	138	Prop Type Ref			
Property					
SAP Rating	83 B	DER	13.14	TER	26.89
Environmental	92 A	% DER<TER	51.13		
CO ₂ Emissions (t/year)	0.54	DFEE	38.30	TFEE	41.63
General Requirements Compliance	Pass	% DFEE<TFEE	8.00		
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com			Assessor ID	E682-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 26.89 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.14 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)41.6 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)38.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.21 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.16 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%

Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power: 0.63

Maximum 1.5 OK

MVHR efficiency: 90%

Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK

Based on:

Overshading: Average

Windows facing South East: 6.24 m², No overhang

Windows facing South: 2.21 m², No overhang

Air change rate: 2.00 ach

Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K

Roof U-value 0.10 W/m²K

Door U-value 1.00 W/m²K

Air permeability 3.0 m³/m²h

Photovoltaic array 454.01 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1163 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2657	0.2628	0.2599	0.2454	0.2425	0.2279	0.2279	0.2250	0.2338	0.2425	0.2483	0.2541 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			8.4500	1.1450	9.6756		(27)
External Wall	19.8500	8.4500	11.4000	0.1500	1.7100		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Main Roof	50.7900		50.7900	0.1000	5.0790		(30)
Total net area of external elements Aum(A, m ²)			88.1400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	22.2571			(33)
Party Wall 1			37.0000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.5542 (36)
Total fabric heat loss							(33) + (36) = 30.8113 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	11.1341	11.0123	10.8905	10.2816	10.1599	9.5510	9.5510	9.4292	9.7945	10.1599	10.4034	10.6470 (38)
Average = Sum(39)m / 12 =	41.9454	41.8236	41.7018	41.0929	40.9711	40.3623	40.3623	40.2405	40.6058	40.9711	41.2147	41.4582 (39)
												41.0625 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8259	0.8235	0.8211	0.8091	0.8067	0.7947	0.7947	0.7923	0.7995	0.8067	0.8115	0.8163 (40)
Days in month												0.8085 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy content (annual)	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1178.3544 (45)
	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)

Water storage loss:												110.0000	(47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)	
If cylinder contains dedicated solar storage													
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)	
Total heat required for water heating calculated for each month													
177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(62)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)	
Solar input (sum of months) = Sum(63)m =												0.0000	(63)
Output from w/h													
177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(64)	
Total per year (kWh/year) = Sum(64)m =												1829.1942	(64)
Heat gains from water heating, kWh/month													
84.8430	75.4698	80.8830	74.7574	74.8902	69.2597	68.7450	72.3625	71.2721	77.4089	79.0216	83.5613	(65)	

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.4839	11.9763	9.7398	7.3736	5.5119	4.6534	5.0281	6.5357	8.7723	11.1384	13.0002	13.8587 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	114.0363	112.3063	108.7138	103.8297	100.6589	96.1941	92.3992	97.2615	98.9891	104.0442	109.7522	112.3135 (72)
Total internal gains	325.5065	323.8179	314.0852	298.5244	283.0012	267.8182	257.8112	262.6320	270.4999	286.2317	304.2921	317.5716 (73)

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
Southeast				6.2400	36.7938	0.4000	0.8000	0.7700	50.9147 (77)			
South				2.2100	46.7521	0.4000	0.8000	0.7700	22.9127 (83)			
Solar gains	73.8274	124.2516	166.4633	201.0539	220.9821	217.6723	210.5612	195.8614	178.4200	136.3256	88.1434	63.3710 (78)
Total gains	399.3338	448.0695	480.5485	499.5783	503.9832	485.4906	468.3724	458.4934	448.9198	422.5573	392.4355	380.9426 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	84.0876	84.3324	84.5787	85.8319	86.0870	87.3857	87.3857	87.6501	86.8616	86.0870	85.5783	85.0756
alpha	6.6058	6.6222	6.6386	6.7221	6.7391	6.8257	6.8257	6.8433	6.7908	6.7391	6.7052	6.6717
util living area	0.9894	0.9764	0.9460	0.8684	0.7244	0.5287	0.3789	0.4032	0.6143	0.8744	0.9736	0.9918 (86)
MIT	20.3998	20.5363	20.7048	20.8751	20.9685	20.9968	20.9997	20.9996	20.9913	20.8883	20.6240	20.3726 (87)
Th 2	20.2310	20.2330	20.2351	20.2455	20.2476	20.2579	20.2579	20.2600	20.2538	20.2476	20.2434	20.2393 (88)
util rest of house	0.9863	0.9700	0.9320	0.8385	0.6755	0.4689	0.3151	0.3386	0.5520	0.8400	0.9654	0.9895 (89)
MIT 2	19.4413	19.6380	19.8753	20.1089	20.2193	20.2559	20.2578	20.2598	20.2477	20.1310	19.7734	19.4087 (90)
Living area fraction									fLA = Living area / (4) =			0.5029 (91)
MIT	19.9233	20.0897	20.2924	20.4942	20.5961	20.6284	20.6309	20.6318	20.6216	20.5118	20.2011	19.8934 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9233	20.0897	20.2924	20.4942	20.5961	20.6284	20.6309	20.6318	20.6216	20.5118	20.2011	19.8934 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9848	0.9686	0.9332	0.8490	0.6987	0.4989	0.3472	0.3711	0.5831	0.8528	0.9648	0.9881 (94)
Useful gains	393.2775	434.0060	448.4397	424.1191	352.1150	242.2292	162.6177	170.1682	261.7516	360.3772	378.6378	376.4279 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	655.3252	635.2872	575.1689	476.4376	364.4819	243.3215	162.6957	170.2901	264.8164	406.0986	539.9588	650.6214 (97a)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	194.9634	135.2610	94.2865	37.6693	9.2009	0.0000	0.0000	0.0000	0.0000	34.0167	116.1512	203.9999 (98)
Space heating												825.5490 (98)
Space heating per m2										(98) / (4) =		16.2542 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	825.5490 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	925.4404 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	48.7074 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2050.5266 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	107.9225 (310b)
Electricity used for heat distribution	31.3260 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	238.1302 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	3492.7184 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1190.3868	0.5190	617.8108 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	158.2120	0.5190	82.1120 (368)
Electrical energy for heat distribution	31.3260	0.5190	16.2582 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			716.1810 (373)
Space and water heating			716.1810 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	238.1302	0.5190	123.5896 (379)
Energy saving/generation technologies			
PV Unit	-454.0100	0.5190	-235.6312 (380)
Total CO2, kg/year			667.4528 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			13.1400 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		13.1400 ZC1
Total Floor Area	TFA	50.7900
Assumed number of occupants	N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.4175 ZC2
CO2 emissions from cooking, equation (L16)		3.1526 ZC3
Total CO2 emissions		33.7101 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		33.7101 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	+	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1575 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4075 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3158 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4027	0.3948	0.3869	0.3474	0.3395	0.3000	0.3000	0.2921	0.3158	0.3395	0.3553	0.3711 (22b)
Effective ac	0.5811	0.5779	0.5748	0.5603	0.5576	0.5450	0.5450	0.5427	0.5499	0.5576	0.5631	0.5689 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			8.4500	1.3258	11.2027		(27)
External Wall	19.8500	8.4500	11.4000	0.1800	2.0520		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Main Roof	50.7900		50.7900	0.1300	6.6027		(30)
Total net area of external elements Aum(A, m ²)			88.1400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.5572		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.8980 (36)
Total fabric heat loss						(33) + (36) =	30.4552 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	24.3480	24.2160	24.0867	23.4794	23.3658	22.8368	22.8368	22.7389	23.0406	23.3658	23.5957	23.8360 (38)
Heat transfer coeff	54.8031	54.6712	54.5419	53.9346	53.8209	53.2920	53.2920	53.1940	53.4957	53.8209	54.0508	54.2911 (39)
Average = Sum(39)m / 12 =												53.9340 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0790	1.0764	1.0739	1.0619	1.0597	1.0493	1.0493	1.0473	1.0533	1.0597	1.0642	1.0689 (40)
HLP (average)												1.0619 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
Heat gains from water heating, kWh/month	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7810	12.2401	9.9544	7.5361	5.6333	4.7559	5.1389	6.6797	8.9655	11.3838	13.2866	14.1640 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782 (72)
Total internal gains	319.4681	317.7464	307.9643	292.3515	276.7872	261.5854	251.5866	256.4406	264.3577	280.1417	298.2431	311.5415 (73)

6. Solar gains

[Jan]		Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W					
Southeast		6.2400	36.7938	0.6300	0.7000	0.7700	70.1668 (77)					
South		2.2100	46.7521	0.6300	0.7000	0.7700	31.5766 (78)					
Solar gains	101.7433	171.2342	229.4072	277.0774	304.5409	299.9797	290.1797	269.9215	245.8850	187.8737	121.4726	87.3332 (83)
Total gains	421.2115	488.9806	537.3716	569.4289	581.3281	561.5651	541.7662	526.3621	510.2428	468.0154	419.7157	398.8747 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	64.3592	64.5145	64.6674	65.3956	65.5337	66.1841	66.1841	66.3060	65.9321	65.5337	65.2550	64.9661
alpha	5.2906	5.3010	5.3112	5.3597	5.3689	5.4123	5.4123	5.4204	5.3955	5.3689	5.3503	5.3311
util living area	0.9910	0.9798	0.9549	0.8941	0.7738	0.5906	0.4302	0.4609	0.6835	0.9078	0.9799	0.9931 (86)
MIT	20.0675	20.2482	20.4792	20.7304	20.9047	20.9823	20.9973	20.9961	20.9617	20.7465	20.3613	20.0316 (87)
Th 2	20.0180	20.0201	20.0222	20.0321	20.0339	20.0425	20.0425	20.0441	20.0392	20.0339	20.0302	20.0263 (88)
util rest of house	0.9883	0.9738	0.9416	0.8642	0.7174	0.5094	0.3380	0.3672	0.6035	0.8752	0.9728	0.9910 (89)
MIT 2	18.7967	19.0581	19.3863	19.7340	19.9472	20.0315	20.0415	20.0426	20.0122	19.7637	19.2307	18.7509 (90)
Living area fraction									fLA = Living area / (4) =			0.5029 (91)
MIT	19.4357	19.6565	19.9359	20.2350	20.4287	20.5096	20.5221	20.5221	20.4897	20.2579	19.7992	19.3949 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4357	19.6565	19.9359	20.2350	20.4287	20.5096	20.5221	20.5221	20.4897	20.2579	19.7992	19.3949 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	415.3806	474.8262	505.2445	496.0228	431.1064	308.7379	208.2760	218.1540	327.7399	413.5646	407.4425	394.5511 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	829.4846	806.7580	732.8192	611.3499	469.7843	314.9351	209.0186	219.2685	341.8192	519.7959	686.4040	824.9505 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	308.0934	223.0582	169.3155	83.0355	28.7764	0.0000	0.0000	0.0000	0.0000	79.0360	200.8523	320.2171 (98)
Space heating												1412.3845 (98)
Space heating per m2										(98) / (4) =		27.8083 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1510.5716 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	308.0934	223.0582	169.3155	83.0355	28.7764	0.0000	0.0000	0.0000	0.0000	79.0360	200.8523	320.2171	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	329.5116	238.5649	181.0861	88.8080	30.7769	0.0000	0.0000	0.0000	0.0000	84.5305	214.8153	342.4782	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	86.4000	85.8891	85.0179	83.4534	81.4534	79.8000	79.8000	79.8000	79.8000	83.2507	85.5226	79.8000	(216)
Fuel for water heating, kWh/month	195.3300	173.4055	184.4968	169.2196	170.4431	156.2471	150.8144	164.4484	163.8315	175.8624	180.1212	190.5268	(219)
Water heating fuel used												2074.7468	(219)
Annual totals kWh/year													
Space heating fuel - main system												1510.5716	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.3763	(232)
Total delivered energy for all uses												3903.6947	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1510.5716	0.2160	326.2835 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2074.7468	0.2160	448.1453 (264)
Space and water heating			774.4288 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.3763	0.5190	126.3123 (268)
Total CO2, kg/m2/year			939.6661 (272)
Emissions per m2 for space and water heating			15.2477 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4870 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.2477 * 1.55) + 2.4870 + 0.7664, rounded to 2 d.p.			26.8900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010566				Issued on Date	29/04/2022
Assessment Reference	139		Prop Type Ref			
Property						
SAP Rating	82 B	DER	14.24	TER	28.66	
Environmental	91 B	% DER<TER	50.31			
CO ₂ Emissions (t/year)	0.58	DFEE	42.33	TFEE	48.20	
General Requirements Compliance	Fail	% DFEE<TFEE	12.16			
Assessor Details	Mr. Tom Sheldrake, Tom Sheldrake, Tel: 01256310717, tom.sheldrake@aeom.com				Assessor ID	E682-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 51 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 28.66 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 14.24 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)48.2 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)42.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.19 (max. 0.30)	0.25 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	1.17 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail

Based on:

Overshading:	Average
Windows facing South East:	6.24 m ² , No overhang
Windows facing South:	2.21 m ² , No overhang
Windows facing South West:	1.97 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Door U-value	1.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	454.01 kWh/Year

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Door			1.8900	1.0000	1.8900		(26)
Window (Uw = 1.20)			10.4200	1.1450	11.9313		(27)
External Wall	39.3500	10.4200	28.9300	0.1500	4.3395		(29a)
Corridor	17.5000	1.8900	15.6100	0.2500	3.9025		(29a)
Main Roof	50.7900		50.7900	0.1000	5.0790		(30)
Total net area of external elements Aum(A, m ²)			107.6400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 27.1423		(33)
Party Wall 1			17.5500	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.4900 (36)
Total fabric heat loss							(33) + (36) = 35.6323 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	11.7351	11.6015	11.4680	10.8002	10.6666	9.9988	9.9988	9.8652	10.2659	10.6666	10.9337	11.2009 (38)
Heat transfer coeff	47.3674	47.2338	47.1003	46.4325	46.2989	45.6311	45.6311	45.4975	45.8982	46.2989	46.5660	46.8332 (39)
Average = Sum(39)m / 12 =												46.3991 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9326	0.9300	0.9274	0.9142	0.9116	0.8984	0.8984	0.8958	0.9037	0.9116	0.9168	0.9221 (40)
HLP (average)												0.9135 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)												Total = Sum(45)m = 1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)

Water storage loss:												110.0000	(47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												1.0294	(52)
Temperature factor from Table 2b												0.6000	(53)
Enter (49) or (54) in (55)												1.0327	(55)
Total storage loss													
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(56)	
If cylinder contains dedicated solar storage													
32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144	(57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)	
Total heat required for water heating calculated for each month													
177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(62)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)	
Solar input (sum of months) = Sum(63)m =												0.0000	(63)
Output from w/h													
177.4469	156.7782	165.5372	149.6214	147.5136	133.0871	129.0318	139.9117	139.1394	155.0886	162.4461	173.5921	(64)	
Total per year (kWh/year) = Sum(64)m =												1829.1942	(64)
Heat gains from water heating, kWh/month													
84.8430	75.4698	80.8830	74.7574	74.8902	69.2597	68.7450	72.3625	71.2721	77.4089	79.0216	83.5613	(65)	

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.3089	11.8209	9.6134	7.2779	5.4403	4.5930	4.9629	6.4509	8.6584	10.9938	12.8314	13.6788 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	114.0363	112.3063	108.7138	103.8297	100.6589	96.1941	92.3992	97.2615	98.9891	104.0442	109.7522	112.3135 (72)
Total internal gains	325.3314	323.6625	313.9587	298.4287	282.9297	267.7578	257.7459	262.5472	270.3860	286.0871	304.1233	317.3917 (73)

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
Southeast					6.2400	36.7938	0.4000	0.8000	0.7700	50.9147 (77)		
South					2.2100	46.7521	0.4000	0.8000	0.7700	22.9127 (78)		
Southwest					1.9700	36.7938	0.4000	0.8000	0.7700	16.0740 (79)		
Solar gains	89.9014	151.6316	203.9258	247.4718	272.9739	269.2882	260.3244	241.4662	218.9840	166.5863	107.3964	77.1270 (83)
Total gains	415.2328	475.2941	517.8846	545.9005	555.9036	537.0461	518.0703	504.0134	489.3700	452.6734	411.5197	394.5187 (84)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	74.4622	74.6728	74.8845	75.9616	76.1807	77.2956	77.2956	77.5225	76.8457	76.1807	75.7437	75.3117
alpha	5.9641	5.9782	5.9923	6.0641	6.0787	6.1530	6.1530	6.1682	6.1230	6.0787	6.0496	6.0208
util living area	0.9897	0.9765	0.9462	0.8705	0.7304	0.5379	0.3869	0.4142	0.6305	0.8838	0.9755	0.9921 (86)
MIT	20.2682	20.4292	20.6281	20.8326	20.9525	20.9938	20.9993	20.9989	20.9842	20.8426	20.5253	20.2372 (87)
Th 2	20.1399	20.1421	20.1443	20.1554	20.1577	20.1688	20.1688	20.1711	20.1644	20.1577	20.1532	20.1488 (88)
util rest of house	0.9867	0.9700	0.9316	0.8391	0.6774	0.4707	0.3142	0.3401	0.5609	0.8488	0.9674	0.9898 (89)
MIT 2	19.1794	19.4116	19.6922	19.9727	20.1152	20.1650	20.1686	20.1707	20.1534	19.9927	19.5600	19.1416 (90)
Living area fraction	19.7269	19.9233	20.1628	20.4051	20.5362	20.5818	20.5863	20.5872	fLA = Living area / (4) =	20.5712	20.4201	0.5029 (91)
MIT	19.7269	19.9233	20.1628	20.4051	20.5362	20.5818	20.5863	20.5872	20.5712	20.4201	20.0454	19.6925 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7269	19.9233	20.1628	20.4051	20.5362	20.5818	20.5863	20.5872	20.5712	20.4201	20.0454	19.6925 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9849	0.9680	0.9320	0.8490	0.7019	0.5043	0.3507	0.3774	0.5954	0.8606	0.9662	0.9882 (94)
Useful gains	408.9509	460.0696	482.6581	463.4592	390.1961	270.8531	181.7113	190.2121	291.3672	389.5719	397.6067	389.8607 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	730.7337	709.6073	643.5231	534.2110	409.1077	272.9559	181.8998	190.5058	297.0164	454.6578	602.8155	725.5646 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	239.4064	167.6893	119.6836	50.9413	14.0702	0.0000	0.0000	0.0000	0.0000	48.4239	147.7503	249.7637 (98)
Space heating												1037.7288 (98)
Space heating per m2												20.4318 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.1800 (306)
Space heating:	
Annual space heating requirement	1037.7288 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.18	1163.2940 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.18	61.2260 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1829.1942 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.18	2050.5266 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.18	107.9225 (310b)
Electricity used for heat distribution	33.8297 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	121.9912 (330a)
Total electricity for the above, kWh/year	121.9912 (331)
Electricity for lighting (calculated in Appendix L)	235.0396 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	3739.9999 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			250.0000 (367a)
Space heating from Heat pump	1285.5283	0.5190	667.1892 (367)
Efficiency of heat source Boilers			99.0000 (367b)
Space heating from Boilers	170.8570	0.5190	88.6748 (368)
Electrical energy for heat distribution	33.8297	0.5190	17.5576 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			773.4216 (373)
Space and water heating			773.4216 (376)
Pumps and fans	121.9912	0.5190	63.3134 (378)
Energy for lighting	235.0396	0.5190	121.9856 (379)
Energy saving/generation technologies			
PV Unit	-454.0100	0.5190	-235.6312 (380)
Total CO2, kg/year			723.0894 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.2400 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			14.2400 ZC1
Total Floor Area		TFA	50.7900
Assumed number of occupants		N	1.7134
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			17.4175 ZC2
CO2 emissions from cooking, equation (L16)			3.1526 ZC3
Total CO2 emissions			34.8101 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			34.8101 ZC8

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.7900 (1b)	x 2.5000 (2b)	= 126.9750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.9750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	+	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				2 * 10 =	20.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1575 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4075 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3464 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4416	0.4330	0.4243	0.3810	0.3724	0.3291	0.3291	0.3204	0.3464	0.3724	0.3897	0.4070 (22b)
Effective ac	0.5975	0.5937	0.5900	0.5726	0.5693	0.5541	0.5541	0.5513	0.5600	0.5693	0.5759	0.5828 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			1.8900	1.0000	1.8900		(26)
TER Opening Type (Uw = 1.40)			10.4200	1.3258	13.8144		(27)
External Wall	39.3500	10.4200	28.9300	0.1800	5.2074		(29a)
Corridor	17.5000	1.8900	15.6100	0.1800	2.8098		(29a)
Main Roof	50.7900		50.7900	0.1300	6.6027		(30)
Total net area of external elements Aum(A, m ²)			107.6400				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	30.3243	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.6674 (36)
Total fabric heat loss						(33) + (36) =	36.9917 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	25.0373	24.8786	24.7230	23.9925	23.8558	23.2195	23.2195	23.1017	23.4646	23.8558	24.1323	24.4214 (38)
Heat transfer coeff	62.0290	61.8703	61.7147	60.9842	60.8475	60.2112	60.2112	60.0934	60.4563	60.8475	61.1240	61.4131 (39)
Average = Sum(39)m / 12 =												60.9835 (39)
HLP	1.2213	1.2182	1.2151	1.2007	1.1980	1.1855	1.1855	1.1832	1.1903	1.1980	1.2035	1.2092 (40)
HLP (average)												1.2007 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7134 (42)
Average daily hot water use (litres/day)												74.8927 (43)
Daily hot water use	82.3820	79.3863	76.3906	73.3949	70.3992	67.4035	67.4035	70.3992	73.3949	76.3906	79.3863	82.3820 (44)
Energy conte	122.1701	106.8508	110.2604	96.1277	92.2368	79.5934	73.7550	84.6349	85.6457	99.8118	108.9524	118.3153 (45)
Energy content (annual)										Total = Sum(45)m =		1178.3544 (45)
Distribution loss (46)m = 0.15 x (45)m	18.3255	16.0276	16.5391	14.4192	13.8355	11.9390	11.0632	12.6952	12.8469	14.9718	16.3429	17.7473 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102 (64)
Heat gains from water heating, kWh/month	77.8975	69.1965	73.9375	68.0359	67.9447	62.5383	61.7994	65.4170	64.5507	70.4634	72.3001	76.6157 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689	85.6689 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.3700	11.8751	9.6575	7.3113	5.4653	4.6140	4.9856	6.4805	8.6981	11.0443	12.8903	13.7416 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	149.2855	150.8347	146.9309	138.6204	128.1298	118.2701	111.6832	110.1341	114.0378	122.3484	132.8390	142.6987 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669	31.5669 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351	-68.5351 (71)
Water heating gains (Table 5)	104.7009	102.9709	99.3784	94.4944	91.3235	86.8587	83.0638	87.9261	89.6537	94.7088	100.4169	102.9782 (72)
Total internal gains	319.0571	317.3814	307.6675	292.1267	276.6192	261.4435	251.4333	256.2414	264.0903	279.8021	297.8468	311.1191 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W
Southeast	6.2400	36.7938	0.6300	0.7000	0.7700	70.1668 (77)
South	2.2100	46.7521	0.6300	0.7000	0.7700	31.5766 (78)
Southwest	1.9700	36.7938	0.6300	0.7000	0.7700	22.1520 (79)
Solar gains	123.8953	208.9673	281.0353	341.0471	376.1922	371.1129 358.7596 332.7706 301.7873 229.5768 148.0056 106.2907 (83)
Total gains	442.9525	526.3487	588.7027	633.1738	652.8114	632.5564 610.1929 589.0120 565.8776 509.3789 445.8524 417.4098 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)											
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	56.8619	57.0077	57.1514	57.8360	57.9660	58.5785	58.5785	58.6934	58.3410	57.9660	57.7037	57.4321
alpha	4.7908	4.8005	4.8101	4.8557	4.8644	4.9052	4.9052	4.9129	4.8894	4.8644	4.8469	4.8288
util living area	0.9902	0.9774	0.9500	0.8860	0.7653	0.5871	0.4300	0.4632	0.6849	0.9057	0.9786	0.9924 (86)
MIT	19.9097	20.1203	20.3867	20.6758	20.8785	20.9743	20.9954	20.9934	20.9457	20.6857	20.2431	19.8704 (87)
Th 2	19.9030	19.9055	19.9079	19.9194	19.9216	19.9316	19.9316	19.9335	19.9278	19.9216	19.9172	19.9127 (88)
util rest of house	0.9870	0.9705	0.9349	0.8529	0.7042	0.4984	0.3278	0.3590	0.5979	0.8708	0.9709	0.9900 (89)
MIT 2	18.4843	18.7885	19.1663	19.5653	19.8127	19.9161	19.9301	19.9310	19.8902	19.5897	18.9769	18.4344 (90)
Living area fraction	19.2011	19.4582	19.7800	20.1237	20.3487	20.4482	20.4658	20.4652	20.4209	20.1408	19.6137	19.1565 (92)
Temperature adjustment	19.2011	19.4582	19.7800	20.1237	20.3487	20.4482	20.4658	20.4652	20.4209	20.1408	19.6137	19.1565 (93)
adjusted MIT	19.2011	19.4582	19.7800	20.1237	20.3487	20.4482	20.4658	20.4652	20.4209	20.1408	19.6137	19.1565 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	436.0542	508.9850	549.1488	544.4271	476.4035	343.0194	231.4839	242.3891	361.9407	447.6595	431.6554	412.3069 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	924.2989	900.7175	819.5692	684.4711	526.2504	352.1272	232.7623	244.2940	382.1412	580.5342	764.8848	918.5232 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	363.2540	263.2443	201.1928	100.8317	37.0861	0.0000	0.0000	0.0000	0.0000	98.8588	239.9252	376.6249 (98)
Space heating												1681.0177 (98)
Space heating per m2												33.0974 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1797.8799 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	363.2540	263.2443	201.1928	100.8317	37.0861	0.0000	0.0000	0.0000	0.0000	98.8588	239.9252	376.6249	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	388.5070	281.5447	215.1794	107.8414	39.6643	0.0000	0.0000	0.0000	0.0000	105.7313	256.6045	402.8073	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	168.7650	148.9365	156.8553	141.2196	138.8317	124.6852	120.3499	131.2298	130.7376	146.4067	154.0442	164.9102	(64)
Efficiency of water heater (217)m	86.8077	86.3179	85.4789	83.9339	81.8399	79.8000	79.8000	79.8000	79.8000	83.7932	85.9916	86.9497	(216)
Fuel for water heating, kWh/month	194.4125	172.5442	183.5018	168.2509	169.6383	156.2471	150.8144	164.4484	163.8315	174.7238	179.1387	189.6616	(219)
Water heating fuel used												2067.2132	(219)
Annual totals kWh/year													
Space heating fuel - main system												1797.8799	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												236.1179	(232)
Total delivered energy for all uses												4176.2110	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1797.8799	0.2160	388.3421 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2067.2132	0.2160	446.5180 (264)
Space and water heating			834.8601 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	236.1179	0.5190	122.5452 (268)
Total CO2, kg/m2/year			996.3303 (272)
Emissions per m2 for space and water heating			16.4375 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4128 (272b)
Emissions per m2 for pumps and fans			0.7664 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.4375 * 1.55) + 2.4128 + 0.7664, rounded to 2 d.p.			28.6600 (273)

B.2 Sample BRUKL (Part L 2013) model output (non-domestic)

GLA Baseline and 'Be Lean' / 'Be Clean' Case BRUKLs

Project name

Unit 1 (GLA Base) Abbey Road Phase 3**As designed****Date:** Tue Apr 05 12:11:04 2022**Administrative information****Building Details****Address:** Kilburn, London,**Certification tool****Calculation engine:** Apache**Calculation engine version:** 7.0.13**Interface to calculation engine:** IES Virtual Environment**Interface to calculation engine version:** 7.0.13**BRUKL compliance check version:** v5.6.b.0**Certifier details****Name:** AECOM**Telephone number:****Address:** Aldgate Tower 2 Leman Street, London, E1 8FA**Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target**

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	31.5
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	31.5
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	23.9
Are emissions from the building less than or equal to the target?	BER ≤ TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.15	0.15	00000007:Surf[10]
Floor	0.25	0.1	0.1	00000007:Surf[0]
Roof	0.25	0.1	0.1	00000007:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.3	1.3	00000007:Surf[8]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building
U _a -Limit = Limiting area-weighted average U-values [W/(m ² K)] U _a -Calc = Calculated area-weighted average U-values [W/(m ² K)] U _i -Calc = Calculated maximum individual element U-values [W/(m ² K)]				
* There might be more than one surface where the maximum U-value occurs. ** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows. *** Display windows and similar glazing are excluded from the U-value check. N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air Permeability	Worst acceptable standard	This building
m ³ /(h.m ²) at 50 Pa	10	3

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	>0.95

1- GLA Base Case Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	0	0	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

"No HWS in project, or hot water is provided by HVAC system"

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1			
00_A_Unit1_Retail	-	1	0	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting

Zone name	Luminous efficacy [lm/W]			General lighting [W]
	Luminaire	Lamp	Display lamp	
Standard value	60	60	22	
00_A_Unit1_Retail	-	100	100	915
00_A_Unit1_Store	100	-	-	23

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
00_A_Unit1_Retail	NO (-40%)	NO
00_A_Unit1_Store	N/A	N/A

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m ²]	120.8	120.8
External area [m ²]	211.2	211.2
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	5
Average conductance [W/K]	62.68	90.97
Average U-value [W/m ² K]	0.3	0.43
Alpha value* [%]	10	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
100	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	12.35	16.23
Cooling	5.54	8.15
Auxiliary	6.2	3.61
Lighting	29.5	42.99
Hot water	1.57	1.49
Equipment*	16.17	16.17
TOTAL **	55.15	72.46

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	150.1	161.5
Primary energy* [kWh/m ²]	140.42	185.48
Total emissions [kg/m ²]	23.9	31.5

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	40.5	109.7	12.3	5.5	6.2	0.91	5.5	0.91	5.5
	Notional	50.4	111.1	16.2	8.1	3.6	0.86	3.79	----	----

Key to terms

- Heat dem [MJ/m2] = Heating energy demand
- Cool dem [MJ/m2] = Cooling energy demand
- Heat con [kWh/m2] = Heating energy consumption
- Cool con [kWh/m2] = Cooling energy consumption
- Aux con [kWh/m2] = Auxiliary energy consumption
- Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
- Cool SSEER = Cooling system seasonal energy efficiency ratio
- Heat gen SSEFF = Heating generator seasonal efficiency
- Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
- ST = System type
- HS = Heat source
- HFT = Heating fuel type
- CFT = Cooling fuel type

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.15	00000007:Surf[10]
Floor	0.2	0.1	00000007:Surf[0]
Roof	0.15	0.1	00000007:Surf[1]
Windows, roof windows, and rooflights	1.5	1.3	00000007:Surf[2]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building
U _{i-Typ} = Typical individual element U-values [W/(m²K)]		U _{i-Min} = Minimum individual element U-values [W/(m²K)]	
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3

Project name

Unit 2 (GLA Base) Abbey Road Phase 3**As designed****Date:** Tue Apr 05 12:08:59 2022**Administrative information****Building Details****Address:** Kilburn, London,**Certification tool****Calculation engine:** Apache**Calculation engine version:** 7.0.13**Interface to calculation engine:** IES Virtual Environment**Interface to calculation engine version:** 7.0.13**BRUKL compliance check version:** v5.6.b.0**Certifier details****Name:** AECOM**Telephone number:****Address:** Aldgate Tower 2 Leman Street, London, E1 8FA**Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target**

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	32.6
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	32.6
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	23.8
Are emissions from the building less than or equal to the target?	BER ≤ TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.15	0.15	00000000:Surf[6]
Floor	0.25	0.1	0.1	00000000:Surf[0]
Roof	0.25	-	-	UNKNOWN
Windows***, roof windows, and rooflights	2.2	1.3	1.3	00000000:Surf[3]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building
U _a -Limit = Limiting area-weighted average U-values [W/(m ² K)] U _a -Calc = Calculated area-weighted average U-values [W/(m ² K)] U _i -Calc = Calculated maximum individual element U-values [W/(m ² K)]				
* There might be more than one surface where the maximum U-value occurs. ** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows. *** Display windows and similar glazing are excluded from the U-value check. N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air Permeability	Worst acceptable standard	This building
m ³ /(h.m ²) at 50 Pa	10	3

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	>0.95

1- GLA Base Case Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	0	0	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

"No HWS in project, or hot water is provided by HVAC system"

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I			
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1		Zone	Standard
00_B_Unit2_Retail	-	1	0	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting

Zone name	Luminous efficacy [lm/W]			General lighting [W]
	Luminaire	Lamp	Display lamp	
Standard value	60	60	22	
00_B_Unit2_Retail	-	100	100	795
00_B_Unit2_Store	100	-	-	17

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
00_B_Unit2_Retail	NO (-76.3%)	NO
00_B_Unit2_Store	N/A	N/A

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m ²]	97.1	97.1
External area [m ²]	169	169
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	5
Average conductance [W/K]	41.03	78.1
Average U-value [W/m ² K]	0.24	0.46
Alpha value* [%]	10	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
100	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	10.13	17.06
Cooling	3.88	7.15
Auxiliary	6.4	3.74
Lighting	31.7	45.68
Hot water	1.65	1.57
Equipment*	17.08	17.08
TOTAL **	53.76	75.2

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	109.97	150.45
Primary energy* [kWh/m ²]	140.01	192.05
Total emissions [kg/m ²]	23.8	32.6

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	33.2	76.8	10.1	3.9	6.4	0.91	5.5	0.91	5.5
	Notional	52.9	97.5	17.1	7.1	3.7	0.86	3.79	----	----

Key to terms

- Heat dem [MJ/m2] = Heating energy demand
- Cool dem [MJ/m2] = Cooling energy demand
- Heat con [kWh/m2] = Heating energy consumption
- Cool con [kWh/m2] = Cooling energy consumption
- Aux con [kWh/m2] = Auxiliary energy consumption
- Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
- Cool SSEER = Cooling system seasonal energy efficiency ratio
- Heat gen SSEFF = Heating generator seasonal efficiency
- Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
- ST = System type
- HS = Heat source
- HFT = Heating fuel type
- CFT = Cooling fuel type

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.15	00000000:Surf[6]
Floor	0.2	0.1	00000000:Surf[0]
Roof	0.15	-	UNKNOWN
Windows, roof windows, and rooflights	1.5	1.3	00000000:Surf[1]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building
U _{i-Typ} = Typical individual element U-values [W/(m²K)]		U _{i-Min} = Minimum individual element U-values [W/(m²K)]	
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3

Project name

Unit 3 (GLA Base) Abbey Road Phase 3**As designed****Date:** Tue Apr 05 12:07:02 2022**Administrative information****Building Details****Address:** Kilburn, London,**Certification tool****Calculation engine:** Apache**Calculation engine version:** 7.0.13**Interface to calculation engine:** IES Virtual Environment**Interface to calculation engine version:** 7.0.13**BRUKL compliance check version:** v5.6.b.0**Certifier details****Name:** AECOM**Telephone number:****Address:** Aldgate Tower 2 Leman Street, London, E1 8FA**Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target**

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	34.8
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	34.8
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	26.3
Are emissions from the building less than or equal to the target?	BER ≤ TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.15	0.15	00000001:Surf[3]
Floor	0.25	0.1	0.1	00000001:Surf[19]
Roof	0.25	0.1	0.1	00000001:Surf[20]
Windows***, roof windows, and rooflights	2.2	1.3	1.3	00000001:Surf[9]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building
U _a -Limit = Limiting area-weighted average U-values [W/(m ² K)] U _a -Calc = Calculated area-weighted average U-values [W/(m ² K)] U _i -Calc = Calculated maximum individual element U-values [W/(m ² K)]				
* There might be more than one surface where the maximum U-value occurs. ** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows. *** Display windows and similar glazing are excluded from the U-value check. N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air Permeability	Worst acceptable standard	This building
m ³ /(h.m ²) at 50 Pa	10	3

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	>0.95

1- GLA Base Case Boiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	0	0	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

"No HWS in project, or hot water is provided by HVAC system"

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1			
00_B_Unit3_Retail	-	1	0	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting

Zone name	Luminous efficacy [lm/W]			General lighting [W]
	Luminaire	Lamp	Display lamp	
Standard value	60	60	22	
00_B_Unit3_Retail	-	100	100	967
00_B_Unit3_Store	100	-	-	18

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
00_B_Unit3_Retail	NO (-28.6%)	NO
00_B_Unit3_Store	N/A	N/A

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m ²]	115.4	115.4
External area [m ²]	226.6	226.6
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	5
Average conductance [W/K]	70.47	103.21
Average U-value [W/m ² K]	0.31	0.46
Alpha value* [%]	10	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
100	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	10.67	14.66
Cooling	7.97	11.83
Auxiliary	6.47	3.79
Lighting	32.32	46.3
Hot water	1.69	1.6
Equipment*	17.41	17.41
TOTAL **	59.12	78.18

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	192.73	206.87
Primary energy* [kWh/m ²]	155.04	205.15
Total emissions [kg/m ²]	26.3	34.8

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance

System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity									
Actual	35	157.8	10.7	8	6.5	0.91	5.5	0.91	5.5
Notional	45.5	161.4	14.7	11.8	3.8	0.86	3.79	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.15	00000001:Surf[3]
Floor	0.2	0.1	00000001:Surf[19]
Roof	0.15	0.1	00000001:Surf[20]
Windows, roof windows, and rooflights	1.5	1.3	00000001:Surf[0]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building
U _{i-Typ} = Typical individual element U-values [W/(m²K)]		U _{i-Min} = Minimum individual element U-values [W/(m²K)]	
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3

GLA 'Be Green' Case BRUKLs

Project name

Unit 1 (GLA Green) Abbey Road Phase 3**As designed****Date:** Tue Apr 05 11:42:10 2022

Administrative information

Building Details

Address: Kilburn, London,

Certification tool

Calculation engine: Apache**Calculation engine version:** 7.0.13**Interface to calculation engine:** IES Virtual Environment**Interface to calculation engine version:** 7.0.13**BRUKL compliance check version:** v5.6.b.0

Certifier details

Name: AECOM**Telephone number:****Address:** Aldgate Tower 2 Leman Street, London, E1 8FA**Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target**

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	30.4
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	30.4
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	21.6
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.15	0.15	00000007:Surf[10]
Floor	0.25	0.1	0.1	00000007:Surf[0]
Roof	0.25	0.1	0.1	00000007:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.3	1.3	00000007:Surf[8]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building
U _a -Limit = Limiting area-weighted average U-values [W/(m ² K)] U _a -Calc = Calculated area-weighted average U-values [W/(m ² K)] U _i -Calc = Calculated maximum individual element U-values [W/(m ² K)]				
* There might be more than one surface where the maximum U-value occurs. ** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows. *** Display windows and similar glazing are excluded from the U-value check. N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air Permeability	Worst acceptable standard	This building
m ³ /(h.m ²) at 50 Pa	10	3

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	>0.95

1- DX System

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.5	5.5	0	0	0.8
Standard value	2.5*	2.6	N/A	N/A	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					

"No HWS in project, or hot water is provided by HVAC system"

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1			
00_A_Unit1_Retail	-	-	-	1	-	-	-	-	-	-	-	N/A

General lighting and display lighting

Zone name	Luminous efficacy [lm/W]			General lighting [W]
	Luminaire	Lamp	Display lamp	
Standard value	60	60	22	
00_A_Unit1_Retail	-	100	100	915
00_A_Unit1_Store	100	-	-	23

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
00_A_Unit1_Retail	NO (-40%)	NO
00_A_Unit1_Store	N/A	N/A

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m ²]	120.8	120.8
External area [m ²]	211.2	211.2
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	5
Average conductance [W/K]	62.62	90.97
Average U-value [W/m ² K]	0.3	0.43
Alpha value* [%]	10	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type

100	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	2.48	5.47
Cooling	5.54	8.15
Auxiliary	3.75	2.44
Lighting	29.5	42.99
Hot water	1.43	1.49
Equipment*	16.17	16.17
TOTAL **	42.69	60.54

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	149.88	161.5
Primary energy* [kWh/m ²]	127.79	178.38
Total emissions [kg/m ²]	21.6	30.4

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	40.2	109.7	2.5	5.5	3.7	4.5	5.5	4.5	5.5
	Notional	50.4	111.1	5.5	8.1	2.4	2.56	3.79	----	----

Key to terms

- Heat dem [MJ/m2] = Heating energy demand
- Cool dem [MJ/m2] = Cooling energy demand
- Heat con [kWh/m2] = Heating energy consumption
- Cool con [kWh/m2] = Cooling energy consumption
- Aux con [kWh/m2] = Auxiliary energy consumption
- Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
- Cool SSEER = Cooling system seasonal energy efficiency ratio
- Heat gen SSEFF = Heating generator seasonal efficiency
- Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
- ST = System type
- HS = Heat source
- HFT = Heating fuel type
- CFT = Cooling fuel type

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.15	00000007:Surf[10]
Floor	0.2	0.1	00000007:Surf[0]
Roof	0.15	0.1	00000007:Surf[1]
Windows, roof windows, and rooflights	1.5	1.3	00000007:Surf[2]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building
U _{i-Typ} = Typical individual element U-values [W/(m²K)]		U _{i-Min} = Minimum individual element U-values [W/(m²K)]	
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3

Project name

Unit 2 (GLA Green) Abbey Road Phase 3**As designed****Date:** Tue Apr 05 11:41:03 2022

Administrative information

Building Details

Address: Kilburn, London,

Certification tool

Calculation engine: Apache**Calculation engine version:** 7.0.13**Interface to calculation engine:** IES Virtual Environment**Interface to calculation engine version:** 7.0.13**BRUKL compliance check version:** v5.6.b.0

Certifier details

Name: AECOM**Telephone number:****Address:** Aldgate Tower 2 Leman Street, London, E1 8FA**Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target**

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	31.4
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	31.4
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	21.8
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.15	0.15	00000000:Surf[6]
Floor	0.25	0.1	0.1	00000000:Surf[0]
Roof	0.25	-	-	UNKNOWN
Windows***, roof windows, and rooflights	2.2	1.3	1.3	00000000:Surf[3]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building
U _a -Limit = Limiting area-weighted average U-values [W/(m ² K)] U _a -Calc = Calculated area-weighted average U-values [W/(m ² K)] U _i -Calc = Calculated maximum individual element U-values [W/(m ² K)] * There might be more than one surface where the maximum U-value occurs. ** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows. *** Display windows and similar glazing are excluded from the U-value check. N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air Permeability	Worst acceptable standard	This building
m ³ /(h.m ²) at 50 Pa	10	3

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	>0.95

1- DX System

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.5	5.5	0	0	0.8
Standard value	2.5*	2.6	N/A	N/A	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					

"No HWS in project, or hot water is provided by HVAC system"

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1			
00_B_Unit2_Retail	-	-	-	1	-	-	-	-	-	-	-	N/A

General lighting and display lighting

Zone name	Luminous efficacy [lm/W]			General lighting [W]
	Luminaire	Lamp	Display lamp	
Standard value	60	60	22	
00_B_Unit2_Retail	-	100	100	795
00_B_Unit2_Store	100	-	-	17

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
00_B_Unit2_Retail	NO (-76.3%)	NO
00_B_Unit2_Store	N/A	N/A

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m ²]	97.1	97.1
External area [m ²]	169	169
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	5
Average conductance [W/K]	40.98	78.1
Average U-value [W/m ² K]	0.24	0.46
Alpha value* [%]	10	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type

100	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	2.04	5.75
Cooling	3.88	7.15
Auxiliary	3.96	2.58
Lighting	31.7	45.68
Hot water	1.51	1.57
Equipment*	17.08	17.08
TOTAL **	43.08	62.73

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	109.84	150.45
Primary energy* [kWh/m ²]	128.94	184.79
Total emissions [kg/m ²]	21.8	31.4

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance									
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
Actual	33	76.9	2	3.9	4	4.5	5.5	4.5	5.5
Notional	52.9	97.5	5.7	7.1	2.6	2.56	3.79	----	----

Key to terms

- Heat dem [MJ/m2] = Heating energy demand
- Cool dem [MJ/m2] = Cooling energy demand
- Heat con [kWh/m2] = Heating energy consumption
- Cool con [kWh/m2] = Cooling energy consumption
- Aux con [kWh/m2] = Auxiliary energy consumption
- Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
- Cool SSEER = Cooling system seasonal energy efficiency ratio
- Heat gen SSEFF = Heating generator seasonal efficiency
- Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
- ST = System type
- HS = Heat source
- HFT = Heating fuel type
- CFT = Cooling fuel type

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.15	00000000:Surf[6]
Floor	0.2	0.1	00000000:Surf[0]
Roof	0.15	-	UNKNOWN
Windows, roof windows, and rooflights	1.5	1.3	00000000:Surf[1]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building
U _{i-Typ} = Typical individual element U-values [W/(m²K)]		U _{i-Min} = Minimum individual element U-values [W/(m²K)]	
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3

Project name

Unit 3 (GLA Green) Abbey Road Phase 3**As designed****Date:** Tue Apr 05 11:39:13 2022**Administrative information****Building Details****Address:** Kilburn, London,**Certification tool****Calculation engine:** Apache**Calculation engine version:** 7.0.13**Interface to calculation engine:** IES Virtual Environment**Interface to calculation engine version:** 7.0.13**BRUKL compliance check version:** v5.6.b.0**Certifier details****Name:** AECOM**Telephone number:****Address:** Aldgate Tower 2 Leman Street, London, E1 8FA**Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target**

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	33.8
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	33.8
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	24.3
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.15	0.15	00000001:Surf[3]
Floor	0.25	0.1	0.1	00000001:Surf[19]
Roof	0.25	0.1	0.1	00000001:Surf[20]
Windows***, roof windows, and rooflights	2.2	1.3	1.3	00000001:Surf[9]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building
U _a -Limit = Limiting area-weighted average U-values [W/(m ² K)] U _a -Calc = Calculated area-weighted average U-values [W/(m ² K)] U _i -Calc = Calculated maximum individual element U-values [W/(m ² K)]				
* There might be more than one surface where the maximum U-value occurs. ** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows. *** Display windows and similar glazing are excluded from the U-value check. N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air Permeability	Worst acceptable standard	This building
m ³ /(h.m ²) at 50 Pa	10	3

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	>0.95

1- DX System

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.5	5.5	0	0	0.8
Standard value	2.5*	2.6	N/A	N/A	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					

"No HWS in project, or hot water is provided by HVAC system"

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1			
00_B_Unit3_Retail	-	-	-	1	-	-	-	-	-	-	-	N/A

General lighting and display lighting

Zone name	Luminous efficacy [lm/W]			General lighting [W]
	Luminaire	Lamp	Display lamp	
Standard value	60	60	22	
00_B_Unit3_Retail	-	100	100	967
00_B_Unit3_Store	100	-	-	18

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
00_B_Unit3_Retail	NO (-28.6%)	NO
00_B_Unit3_Store	N/A	N/A

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m ²]	115.4	115.4
External area [m ²]	226.6	226.6
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	5
Average conductance [W/K]	70.41	103.21
Average U-value [W/m ² K]	0.31	0.46
Alpha value* [%]	10	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
100	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	2.15	4.94
Cooling	7.97	11.83
Auxiliary	4.03	2.63
Lighting	32.32	46.3
Hot water	1.54	1.6
Equipment*	17.41	17.41
TOTAL **	48.01	67.3

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	192.61	206.87
Primary energy* [kWh/m ²]	143.7	198.4
Total emissions [kg/m ²]	24.3	33.8

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	34.8	157.8	2.1	8	4	4.5	5.5	4.5	5.5
	Notional	45.5	161.4	4.9	11.8	2.6	2.56	3.79	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.15	00000001:Surf[3]
Floor	0.2	0.1	00000001:Surf[19]
Roof	0.15	0.1	00000001:Surf[20]
Windows, roof windows, and rooflights	1.5	1.3	00000001:Surf[0]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building
U _{i-Typ} = Typical individual element U-values [W/(m²K)]		U _{i-Min} = Minimum individual element U-values [W/(m²K)]	
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3

B.3 GLA carbon emissions reporting spreadsheet (version 1.2)

TABLE 1. DEVELOPMENT INFORMATION		NOTES
Date of Application		Please provide the date the application was submitted to the Local Planning Authority.
Local Planning Authority		Please indicate the Local Planning Authority determining the application.
Confirmed carbon offset price (tonne of carbon dioxide)		Please confirm the agreed carbon offset price for the Local Planning Authority. Evidence of communication on the price is expected to be included in the energy assessment. If no value is entered then the GLA's recommend price of £95 per tonne of carbon dioxide will be used.

TABLE 2. CARBON (CO ₂) FACTORS			NOTES
Fuel type	Fuel Carbon Factor (kgCO ₂ /kWh)		
	SAP 2012	SAP 10.0	
Natural Gas	0.216	0.210	SAP 2012 and SAP 10.0 carbon emission factors (Table 12).
Grid Electricity	0.519	0.233	
Enter Carbon Factor 1			These factors should be used where alternative fuel is used to grid gas and electricity. Carbon emission factors used here must be taken from Table 12 within the SAP 2012 and SAP 10.0 documents. Fuel type should be updated and referenced in Column A when additional carbon factor values have been added.
Enter Carbon Factor 2			
Enter Carbon Factor 3			
Enter Carbon Factor 4			
Bespoke DH Factor			This should only be used for non-domestic buildings that are connecting to District Heating (DH) networks. The network carbon factor should be calculated in line with Part L requirements and separate factors should be provided using SAP 2012 and SAP 10.0 fuel factors. Assumptions and workings should be shown below in Table 4.

TABLE 3. BESPOKE DH CARBON FACTOR CALCULATION METHODOLOGY
Please provide below details of the calculation methodology followed to establish the bespoke carbon factor, if applicable.

TABLE 4. DISTRIBUTION LOSSES		COMMENTS	
Primary network (buried pipe)	Total pipe length (m)		
	Average heat loss rate (W/m)		
Secondary network (buried pipe)	Total pipe length (m)		
	Average heat loss rate (W/m)		
Total losses (MWh/year)			
Total heat supplied (MWh/year)			
Distribution Loss Factor (DLF)			
Calculation included in energy statement (yes/no)			

The applicant should complete all the light blue cells including information on the modelled units, the area per unit, the number of units, the baseline energy consumption figures, the TER and the TFEF.

SAP 2012 CO₂ PERFORMANCE

SAP 10.0 CO₂ PERFORMANCE

DOMESTIC ENERGY CONSUMPTION AND CO₂ ANALYSIS

Unit identifier (e.g. plot number, dwelling type etc.)	Model total floor area (m ²)	Number of units	Total area represented by model (m ²)	VALIDATION CHECK		REGULATED ENERGY CONSUMPTION PER UNIT (kWh p.a.) - TER WORKSHEET							REGULATED CO ₂ EMISSIONS PER UNIT (kgCO ₂ p.a.)					REGULATED CO ₂ EMISSIONS PER UNIT					SAP 10.0 CO ₂ emissions (kgCO ₂ p.a.)	Calculated TER SAP 10.0 (kgCO ₂ / m ²)	
				Calculated TER 2012 (kgCO ₂ / m ²)	TER Worksheet TER 2012 (kgCO ₂ / m ²)	Space Heating	Fuel type Space Heating	Domestic Hot Water	Fuel type Domestic Hot Water	Lighting	Auxiliary	Cooling	Space Heating	Domestic Hot Water	Lighting	Auxiliary	Cooling	Space Heating	Domestic Hot Water	Lighting	Auxiliary	Cooling			
TER Worksheet (Row 4)				TER Worksheet (Row 273)	TER Worksheet (Row 211)	TER Worksheet (Row 219)		TER Worksheet (Row 232)	TER Worksheet (Row 231)	N/A															
1	121.42	1	121.42	17.2	17.2	5845.2336	Natural Gas	2534.9308	Natural Gas	457.4067	75	1,263	548	237	39	2,086	1,227	532	107	17	1,884	16.5			
2	65.62	1	65.62	19.6	19.6	2734.0248	Natural Gas	2237.1868	Natural Gas	332.4474	75	891	483	173	39	1,385	574	470	77	17	1,139	17.4			
3	69.86	1	69.86	17.1	17.1	2299.0249	Natural Gas	2299.433	Natural Gas	310.4787	75	497	497	161	39	1,193	483	453	72	17	1,055	15.1			
4	74.63	1	74.63	19.0	19.0	3236.6258	Natural Gas	2328.9355	Natural Gas	340.3127	75	899	503	177	39	1,410	680	489	79	17	1,266	17.0			
5	50.79	1	50.79	21.0	21.0	2110.5862	Natural Gas	2058.3561	Natural Gas	243.3763	75	456	445	126	39	1,066	443	432	67	17	950	16.7			
6	87.52	1	87.52	17.3	17.3	3499.917	Natural Gas	2455.2298	Natural Gas	369.11	75	756	526	192	39	1,512	735	511	86	17	1,309	15.4			
7	87	1	87	16.9	16.9	3295.0262	Natural Gas	2433.0077	Natural Gas	381.4579	75	712	526	198	39	1,474	692	511	89	17	1,309	15.0			
8	73.12	1	73.12	16.4	16.4	1900.6428	Natural Gas	2343.3167	Natural Gas	333.673	75	411	506	173	39	1,129	399	492	78	17	986	13.5			
9	72.03	1	72.03	16.3	16.3	1782.8318	Natural Gas	2335.5422	Natural Gas	327.4893	75	385	504	170	39	1,098	374	480	76	17	959	13.3			
10	69.86	3	209.88	16.3	16.3	2033.4455	Natural Gas	2306.1331	Natural Gas	310.475	75	439	498	161	39	1,137	427	484	72	17	1,001	14.3			
11	74.63	3	223.89	16.9	16.9	2127.376	Natural Gas	2351.5048	Natural Gas	340.3127	75	490	508	177	39	1,183	447	494	79	17	1,037	13.9			
12	50.79	4	203.16	17.7	17.7	2118.9247	Natural Gas	2081.6556	Natural Gas	243.3763	75	285	449	126	39	1,087	477	437	67	17	761	15.5			
13	87.52	6	525.12	14.6	14.6	2391.5284	Natural Gas	2457.5502	Natural Gas	369.11	75	817	531	192	39	1,278	562	516	86	17	1,122	12.8			
14	87	6	522	14.1	14.1	2129.9693	Natural Gas	2458.6118	Natural Gas	381.4579	75	460	531	198	39	1,228	447	516	89	17	1,070	12.3			
15	73.12	3	219.36	16.2	16.2	1800.897	Natural Gas	2146.3256	Natural Gas	333.673	75	389	517	173	39	1,108	378	453	78	17	966	13.2			
16	72.03	3	216.09	16.3	16.3	1782.8318	Natural Gas	2335.5422	Natural Gas	327.4893	75	385	504	170	39	1,098	374	480	76	17	959	13.3			
17	69.86	1	69.86	16.3	16.3	2705.1873	Natural Gas	2290.5784	Natural Gas	310.4787	75	884	496	181	39	1,279	568	481	72	17	1,139	16.3			
18	74.63	1	74.63	17.9	17.9	2863.5144	Natural Gas	2335.4661	Natural Gas	340.3127	75	619	504	177	39	1,339	491	490	79	17	1,189	15.9			
19	73.12	1	73.12	17.0	17.0	2433.9145	Natural Gas	2329.4504	Natural Gas	333.5931	75	526	503	173	39	1,241	511	489	78	17	1,096	15.0			
20	72.03	1	72.03	17.0	17.0	2368.8238	Natural Gas	2319.7455	Natural Gas	327.4893	75	512	501	170	39	1,222	497	497	76	17	1,078	15.0			
21	50.79	2	101.58	19.5	19.5	1758.9252	Natural Gas	2068.1137	Natural Gas	236.1179	75	380	447	123	39	1,088	389	434	65	17	876	17.3			
22	50.79	1	50.79	21.4	21.4	2224.8437	Natural Gas	2056.7062	Natural Gas	236.1179	75	481	444	123	39	1,096	467	432	65	17	972	19.1			
23	87.52	1	87.52	16.5	16.5	3158.7656	Natural Gas	2441.1466	Natural Gas	369.11	75	602	527	192	39	1,440	653	513	86	17	1,279	14.6			
24	87	1	87	15.9	15.9	2847.5195	Natural Gas	2441.3986	Natural Gas	381.4579	75	615	527	198	39	1,379	598	513	89	17	1,217	14.0			
25	50.82	1	50.82	20.9	20.9	2095.1862	Natural Gas	2059.2411	Natural Gas	243.302	75	453	445	126	39	1,063	440	432	67	17	947	16.6			
26	69.82	1	69.82	18.6	18.6	2794.0239	Natural Gas	2384.7474	Natural Gas	312.5672	75	604	484	162	39	1,298	457	480	73	17	1,157	16.6			
27	72.77	1	72.77	19.9	19.9	3433.92	Natural Gas	2307.6565	Natural Gas	327.7949	75	742	498	170	39	1,449	721	485	76	17	1,300	17.9			
28	72.77	1	72.77	20.4	20.4	3595.6226	Natural Gas	2304.5178	Natural Gas	327.9999	75	777	498	170	39	1,484	755	484	76	17	1,333	18.3			
29	73.52	1	73.52	19.0	19.0	3003.0873	Natural Gas	2319.9008	Natural Gas	323.3067	75	692	501	168	39	1,400	673	487	75	17	1,253	17.0			
30	50.79	1	50.79	19.7	19.7	1758.8052	Natural Gas	2065.9786	Natural Gas	262.7644	75	380	446	136	39	1,062	370	434	61	17	882	17.4			
31	50.79	1	50.79	19.8	19.8	1821.3525	Natural Gas	2065.6122	Natural Gas	243.3763	75	393	446	126	39	1,005	383	434	67	17	890	17.5			
32	50.79	1	50.79	16.6	16.6	1057.3423	Natural Gas	2091.5813	Natural Gas	243.3763	75	228	452	126	39	845	439	439	67	17	735	14.5			
33	73.52	1	73.52	15.3	15.3	1900.2748	Natural Gas	2349.4907	Natural Gas	323.3067	75	410	507	168	39	1,125	398	493	75	17	985	13.4			
34	72.77	4	291.08	16.8	16.8	2363.4274	Natural Gas	2327.8595	Natural Gas	327.7949	75	511	503	170	39	1,222	498	489	76	17	1,078	14.8			
35	72.77	8	582.16	17.2	17.2	2512.6891	Natural Gas	2323.3839	Natural Gas	327.9999	75	843	502	172	39	1,254	528	488	76	17	1,109	15.2			
36	73.52	8	588.16	15.9	15.9	2105.6855	Natural Gas	2343.0923	Natural Gas	323.3067	75	455	506	168	39	1,168	442	492	75	17	1,027	14.9			
37	50.79	8	406.32	16.4	16.4	1026.7355	Natural Gas	2093.79	Natural Gas	243.3763	75	217	452	126	39	835	410	440	67	17	725	14.3			
38	50.79	5	253.95	16.6	16.6	1057.3423	Natural Gas	2091.5813	Natural Gas	243.3763	75	228	452	126	39	845	439	439	67	17	735	14.5			
39	50.79	4	203.16	16.6	16.6	1057.3423	Natural Gas	2091.5813	Natural Gas	243.3763	75	228	452	126	39	845	439	439	67	17	735	14.5			
40	73.52	4	294.08	15.1	15.1	1831.3977	Natural Gas	2351.8646	Natural Gas	323.3067	75	393	508	168	39	1,108	502	484	76	17	969	13.2			
41	72.77	1	72.77	18.7	18.7	3009.5467	Natural Gas	2314.598	Natural Gas	327.7949	75	650	500	170	39	1,389	632	486	75	17	1,212	16.7			
42	50.79	1	50.79	18.7	18.7	1553.361	Natural Gas	2073.3874	Natural Gas	243.3763	75	336	448	126	39	949	328	435	67	17	826	16.5			
43	73.52	1	73.52	16.9	16.9	2471.7617	Natural Gas	2334.6235	Natural Gas	323.3067	75	524	504	168	39	1,245	518	480	75	17	1,102	15.0			
44	50.79	3	152.37	17.8	17.8	1348.8867	Natural Gas	2081.1746	Natural Gas	236.1179	75	292	450	123	39	903	283	437	65	17	793	15.6			
Sum	6,972	192	6,972	16.5	-	208,463	N/A	231,637	N/A	31,442	7,650	0	45,028	50,834	16,318	3,970	0	115,357	43,777	48,644	7,326	1,782	0	191,530	14.6

NON-DOMESTIC ENERGY CONSUMPTION AND CO₂ ANALYSIS

Building Use	Model Area (m²)	Number of units	Total area represented by model (m²)	VALIDATION CHECK		REGULATED ENERGY CONSUMPTION BY END USE (kWh/m² p.a.) TER - SOURCE: BRUKL OUTPUT									REGULATED ENERGY CONSUMPTION BY FUEL TYPE (kWh/m² p.a.) TER - SOURCE: BRUKL INP or "SIR.CSV FILE"									REGULATED ENERGY CONSUMPTION BY FUEL TYPE (kWh/m² p.a.) - TER BRUKL				REGULATED CO₂ EMISSIONS	
				Calculated TER 2012 (kgCO₂ / m²)	BRUKL TER 2012 (kgCO₂ / m²)	Space Heating (kWh/m² p.a.)	Fuel type Space Heating	Domestic Hot Water (kWh/m² p.a.)	Fuel type Domestic Hot Water	Lighting (kWh/m² p.a.)	Auxiliary (kWh/m² p.a.)	Cooling (kWh/m² p.a.)	Natural Gas	Grid Electricity	Equipment	2012 CO₂ emissions (kgCO₂ p.a.)	Natural Gas	Grid Electricity	Unregulated Grid Electricity	SAP10.0 CO₂ emissions (kgCO₂ p.a.)	BRUKL TER SAP10.0 (kgCO₂ / m²)								
Unit 1 (Retail) Bloc	120.824	1	120.824	31.5	31.5	16.2291	Natural Gas	1.48821	Natural Gas	42.9883	3.60768	8.14625	0.216 kgCO₂/kWh	0.519 kgCO₂/kWh	0.519 kgCO₂/kWh	3.809	18	53	16	1,952	16.2								
Unit 2 (Retail) Bloc	97.0555	1	97.0555	32.6	32.6	17.0596	Natural Gas	1.57154	Natural Gas	45.8516	3.73991	7.14738	19	55	17	3.169	19	55	17	1,627	16.8								
Unit 3 (Retail) Bloc	115.401	1	115.401	34.8	34.8	14.635	Natural Gas	1.60372	Natural Gas	46.2995	3.78873	11.8297	16	60	17	4.021	16	60	17	2,017	17.5								
Sum	333	3	333	33.0	-	5,308	N/A	517	N/A	14,971	1,236	3,043	5,825	18,767	5,621	N/A	N/A	10,999	5,825	18,767	5,621	N/A	N/A	5,096	16.8				

The applicant should complete all the light blue cells including information on the 'be lean' energy consumption figures, the 'be lean' DER, the DFEE and the regulated energy demand of the 'be lean' scenario.

DOMESTIC ENERGY CONSUMPTION AND CO ₂ ANALYSIS												SAP 2012 CO ₂ PERFORMANCE												SAP 10.0 CO ₂ PERFORMANCE											
Unit identifier (e.g. plot number, dwelling type etc.)	Model total floor area (m ²)	Number of units	Total area represented by model (m ²)	VALIDATION CHECK		REGULATED ENERGY CONSUMPTION PER UNIT (kWh p.a.) - 'BE LEAN' SAP DER WORKSHEET										REGULATED CO ₂ EMISSIONS PER UNIT (kgCO ₂ p.a.)																			
				Calculated DER 2012 (kgCO ₂ / m ²)	DER Worksheet DER 2012 (kgCO ₂ / m ²)	Space Heating	Fuel type Space Heating	Domestic Hot Water (Heat Source 1)	Fuel type Domestic Hot Water	Secondary Heating system	Fuel type Space Heating	Lighting	Auxiliary	Cooling	2012 CO ₂ emissions (kgCO ₂ p.a.)	Space Heating CO ₂ emissions (kgCO ₂ p.a.)	Domestic Hot Water CO ₂ emissions (kgCO ₂ p.a.)	Lighting CO ₂ emissions (kgCO ₂ p.a.)	Auxiliary CO ₂ emissions (kgCO ₂ p.a.)	Cooling CO ₂ emissions (kgCO ₂ p.a.)	Unregulated (kgCO ₂ p.a.)	SAP 10.0 CO ₂ emissions (kgCO ₂ p.a.)	Calculated DER SAP 10.0 (kgCO ₂ / m ²)												
				DER Sheet (Row 384)	DER Sheet (Row 307a) + (Row 310b x 0.01) (Row 307a x 0.01)	Select fuel type	DER Sheet (Row 310b + (Row 307b x 0.01))	Select fuel type	DER Sheet (Row 309)	Select fuel type	DER Sheet (Row 332)	DER Sheet (Row 313 + 311)	DER Sheet (Row 315)																						
1	121.42	1	121.42	15.9	15.9	4279.438994	Natural Gas	2652.424468	Natural Gas		452.1641	379.303			1,928	899	557	105	88		808	1,649	13.6												
2	65.62	1	65.62	18.3	18.3	1945.142173	Natural Gas	2330.940023	Natural Gas		322.7961	214.7054			1,203	488	489	75	90		837	1,023	15.6												
3	69.96	1	69.96	16.3	16.3	1353.248916	Natural Gas	2379.109721	Natural Gas		201.4405				1,072	284	500	72	47		965	903	12.9												
4	74.63	1	74.63	17.3	17.3	2216.248985	Natural Gas	2426.430279	Natural Gas		332.597	220.8939			1,290	465	810	77	51		894	1,104	14.8												
5	50.79	1	50.79	19.0	19.0	1386.326592	Natural Gas	2145.982011	Natural Gas		153.6233				957	292	451	85	36		435	833	16.4												
6	87.52	1	87.52	16.0	16.0	2443.368715	Natural Gas	2530.389944	Natural Gas		369.11	254.7272			1,398	513	831	86	69		686	1,190	13.6												
7	87	1	87	15.9	15.9	2378.458547	Natural Gas	2526.632073	Natural Gas		373.0005	252.8055			1,384	499	531	87	69		674	1,176	13.5												
8	73.12	1	73.12	14.5	14.5	2206.646751	Natural Gas	2411.672061	Natural Gas		326.3881	206.027			1,059	254	506	76	48		585	885	12.1												
9	72.03	1	72.03	13.6	13.6	967.4202255	Natural Gas	2400.691508	Natural Gas		330.9819	202.2567			187	519	167	105	75		477	808	11.2												
10	69.96	3	209.88	14.7	14.7	1155.762011	Natural Gas	2379.109721	Natural Gas		310.4634	199.780			251	514	104	72	47		955	952	12.3												
11	74.63	3	223.89	14.2	14.2	1175.76548	Natural Gas	2426.430279	Natural Gas		332.597	211.4916			1,060	247	510	77	49		894	883	11.8												
12	50.79	4	203.16	15.9	15.9	666.2115084	Natural Gas	2145.982011	Natural Gas		238.1302	147.1603			807	140	451	85	34		435	680	13.4												
13	87.52	6	525.12	13.4	13.4	1416.771508	Natural Gas	2530.389944	Natural Gas		369.11	245.5202			1,172	286	531	86	57		666	972	11.1												
14	87	6	525.12	13.2	13.2	1300.962793	Natural Gas	2526.953073	Natural Gas		373.0005	243.2229			1,147	273	531	87	57		674	947	10.9												
15	73.12	3	219.36	14.2	14.2	1117.429262	Natural Gas	2411.672061	Natural Gas		327.2105	202.2567			1,039	236	506	76	48		585	865	11.8												
16	72.03	3	216.09	13.5	13.5	860.3111732	Natural Gas	2400.691508	Natural Gas		320.9819	202.1024			976	519	167	105	75		477	878	11.2												
31	69.96	1	69.96	16.9	16.9	1853.233743	Natural Gas	2379.109721	Natural Gas		330.4834	205.9149			1,182	389	500	72	48		965	1,009	14.4												
32	74.63	1	74.63	18.4	18.4	1927.877095	Natural Gas	2426.430279	Natural Gas		332.597	218.223			1,226	465	810	77	51		894	1,043	14.8												
36	73.12	1	73.12	16.9	16.9	1668.884358	Natural Gas	2411.672061	Natural Gas		326.3147	212.1461			1,161	350	500	76	49		985	982	13.4												
37	72.03	1	72.03	15.3	15.3	1417.935351	Natural Gas	2400.691508	Natural Gas		330.9819	207.1758			1,099	298	504	75	48		878	925	12.8												
38	50.79	2	101.58	17.9	17.9	1127.815384	Natural Gas	2145.982011	Natural Gas		235.0396	151.2917			908	237	451	85	35		435	778	15.3												
44	50.79	1	50.79	19.7	19.7	1548.963017	Natural Gas	2145.982011	Natural Gas		235.0396	151.061			1,001	325	451	85	36		435	867	17.1												
45	87.52	1	87.52	15.3	15.3	2176.142325	Natural Gas	2530.389944	Natural Gas		369.11	252.393			1,339	497	531	86	69		666	1,133	12.9												
46	87	1	87	14.8	14.8	1925.473966	Natural Gas	2526.953073	Natural Gas		373.0005	248.8123			1,284	546	484	87	58		664	1,080	12.4												
47	50.82	1	50.82	19.8	19.8	1537.031732	Natural Gas	2146.169721	Natural Gas		238.2733	169.8779			1,007	323	451	86	40		435	869	17.1												
48	69.82	1	69.82	17.3	17.3	1912.236983	Natural Gas	2375.755462	Natural Gas		209.2466	225.6109			1,204	401	499	72	53		963	1,025	14.7												
49	72.77	1	72.77	16.6	16.6	2563.261453	Natural Gas	2408.174972	Natural Gas		322.2135	213.7903			1,352	538	506	75	50		983	1,169	16.1												
50	72.77	1	72.77	19.0	19.0	2690.224469	Natural Gas	2408.174972	Natural Gas		322.2254	214.8664			1,380	565	506	75	50		983	1,196	16.4												
51	73.52	1	73.52	17.6	17.6	2293.774525	Natural Gas	2415.632179	Natural Gas		323.3395	213.0217			1,293	479	507	75	50		988	1,111	15.1												
52	50.79	1	50.79	17.8	17.8	1060.116201	Natural Gas	2145.982011	Natural Gas		255.086	150.6858			903	223	451	89	35		435	768	15.1												
53	50.79	1	50.79	18.1	18.1	1380.964358	Natural Gas	2145.982011	Natural Gas		238.1302	151.7674			921	248	451	85	35		435	790	15.5												
54	50.79	1	50.79	16.2	16.2	511.4815642	Natural Gas	2145.982011	Natural Gas		238.1302	145.7755			773	464	107	85	34		435	648	12.7												
55	73.52	1	73.52	14.0	14.0	1075.770279	Natural Gas	2415.632179	Natural Gas		323.3395	202.2444			1,027	226	507	75	47		688	856	11.6												
56	72.77	4	291.08	18.5	18.5	1553.234532	Natural Gas	2408.174972	Natural Gas		322.2135	204.709			1,139	327	506	75	48		953	955	13.1												
57	72.77	8	582.16	16.8	16.8	1662.707821	Natural Gas	2408.174972	Natural Gas		322.2254	205.6701			1,163	349	506	75	48		983	978	13.4												
58	73.52	8	588.16	14.6	14.6	1280.907398	Natural Gas	2415.632179	Natural Gas		323.3395	204.0639			1,072	269	507	75	48		988	899	12.2												
59	50.79	8	406.32	19.0	19.0	468.7789844	Natural Gas	2145.982011	Natural Gas		238.1302	145.1933			764	98	451	85	34		435	638	12.6												
60	50.79	5	253.95	16.2	16.2	511.4815642	Natural Gas	2145.982011	Natural Gas		238.1302	145.7755			773	107	451	85	34		435	648	12.7												
61	50.79	4	203.16	15.2	15.2	511.4815642	Natural Gas	2145.982011	Natural Gas		238.1302	145.7755			773	107	451	85	34		435	648	12.7												
62	73.52	4	294.08	13.8	13.8	1003.762346	Natural Gas	2415.632179	Natural Gas		323.3395	201.579			1,011	211	507	75	47		688	840	11.4												
64	72.77	1	72.77	17.3	17.3	2135.080559	Natural Gas	2408.174972	Natural Gas		322.2135	209.8978			1,258	448	506	75	49		985	1,078	14.8												
69	50.79	1	50.79	17.3	17.3	994.2574302	Natural Gas	2145.982011	Natural Gas		238.1302	150.9963			880	209	451	85	35		435	788	14.8												
90	73.52	1	73.52	16.6	16.6	1622.009497	Natural Gas	2415.632179	Natural Gas		323.3395	207.1168			1,147	341	507	75	48		988	972	13.2												
94	50.79	3	152.37	16.6	16.6	821.8460335	Natural Gas	2145.982011	Natural Gas		235.0396	148.5533			840	173	451	85	35		435	713	14.0												
Sum	6,972	102	6,972	15.2	-	128,930	N/A	239,082	N/A	0	N/A	31,014	19,950	0	N/A	27,849	51,842	16,096	10,354	0	N/A	105,341	27,075	60,207	7,226	4,648	0	56,074	88,157	12.8					
NON-DOMESTIC ENERGY CONSUMPTION AND CO ₂ ANALYSIS												REGULATED ENERGY CONSUMPTION BY END USE (kWh/m ² p.a.) - 'BE LEAN' BER - SOURCE: BRUKL OUTPUT												REGULATED CO ₂ EMISSIONS PER UNIT											
Building Use	Model Area (m ²)	Number of units	Total area represented by model (m ²)	VALIDATION CHECK		REGULATED ENERGY CONSUMPTION BY END USE (kWh/m ² p.a.) - 'BE LEAN' BER - SOURCE: BRUKL OUTPUT										REGULATED ENERGY CONSUMPTION BY FUEL TYPE (kWh/m ² p.a.) - 'BE LEAN' BER - SOURCE: BRUKL INPUT OR 'SIM.CSV FILE										REGULATED CO ₂ EMISSIONS PER UNIT				SAP 10.0 CO ₂ emissions (kgCO ₂ p.a.)	BRUKL BER SAP 10.0 (kgCO ₂ / m ²)				
				Calculated BER 2012 (kgCO ₂ / m ²)	BRUKL BER 2012 (kgCO ₂ / m ²)	Space Heating (kWh/m ² p.a.)	Fuel type Space Heating	Domestic Hot Water (kWh/m ² p.a.)	Fuel type Domestic Hot Water	Lighting (kWh/m ² p.a.)	Auxiliary (kWh/m ² p.a.)	Cooling (kWh/m ² p.a.)	Natural Gas	Grid Electricity	Equipment	2012 CO ₂ emissions (kgCO ₂ p.a.)	Natural Gas	Grid Electricity	Equipment	2012 CO ₂ emissions (kgCO ₂ p.a.)	Natural Gas	Grid Electricity	Equipment	2012 CO ₂											

The applicant should complete all the light blue cells including information on the 'be clear' energy consumption figures and the 'be clear' DER.

DOMESTIC ENERGY CONSUMPTION AND CO ₂ ANALYSIS																																				
Unit identifier (B-u, plot number, dwelling type etc.)	Model floor area (m ²)	Number of units (n _u)	Total area represented by model (m ²)	VALIDATION CHECK		REGULATED ENERGY CONSUMPTION PER UNIT (kWh p.a.) - 'BE CLEAR' SAP DER WORKSHEET														REGULATED CO ₂ EMISSIONS PER UNIT (kgCO ₂ p.a.)										SAP 18.0 CO ₂ PERFORMANCE						
				Calculated DER 2012 (kgCO ₂ /m ²)	DER Worksheet DER 2012 (kgCO ₂ /m ²)	Space Heating (Der Source 1)	Fuel type Space Heating	Domestic Hot Water (Der Source 1)	Fuel type Domestic Hot Water	Space and Domestic Hot Water from CHP	Fuel type CHP	Total Electricity generated by CHP (kWh p.a.)	Secondary Heating system	Fuel type Secondary Heating	Lighting	Auxiliary	Cooling	Space Heating	Domestic Hot Water	Space Heating and DHW from CHP	Electricity generated by CHP	Lighting	Auxiliary	Cooling	2012 CO ₂ emissions (kgCO ₂ p.a.)	Space Heating	Domestic Hot Water	Space Heating and DHW from CHP	Electricity generated by CHP	Lighting	Auxiliary	Cooling	SAP 18.0 CO ₂ emissions (kgCO ₂ p.a.)	Calculated DER SAP 18.0 (kgCO ₂ /m ²)		
				DER Sheet (Row 24)	DER Sheet (Row 24)	Select fuel type	DER Sheet (Row 24)	Select fuel type	DER Sheet (Row 24)	Select fuel type	DER Sheet (Row 24)	Select fuel type	DER Sheet (Row 24)	DER Sheet (Row 24)	DER Sheet (Row 24)	DER Sheet (Row 24)	DER Sheet (Row 24)	DER Sheet (Row 24)	DER Sheet (Row 24)	DER Sheet (Row 24)	DER Sheet (Row 24)	DER Sheet (Row 24)	DER Sheet (Row 24)	DER Sheet (Row 24)	DER Sheet (Row 24)	DER Sheet (Row 24)	DER Sheet (Row 24)	DER Sheet (Row 24)	DER Sheet (Row 24)	DER Sheet (Row 24)	DER Sheet (Row 24)	DER Sheet (Row 24)	DER Sheet (Row 24)	DER Sheet (Row 24)	DER Sheet (Row 24)	DER Sheet (Row 24)
1	121.42	1	121.42	16.9	16.9	Natural Gas	16.9	Natural Gas	16.9	Natural Gas	16.9	Natural Gas	16.9	Natural Gas	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9
2	69.82	1	69.82	16.3	16.3	Natural Gas	16.3	Natural Gas	16.3	Natural Gas	16.3	Natural Gas	16.3	Natural Gas	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3
3	74.83	1	74.83	17.3	17.3	Natural Gas	17.3	Natural Gas	17.3	Natural Gas	17.3	Natural Gas	17.3	Natural Gas	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3
4	50.79	1	50.79	19.0	19.0	Natural Gas	19.0	Natural Gas	19.0	Natural Gas	19.0	Natural Gas	19.0	Natural Gas	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
5	87.52	1	87.52	16.0	16.0	Natural Gas	16.0	Natural Gas	16.0	Natural Gas	16.0	Natural Gas	16.0	Natural Gas	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0
6	87	1	87	16.9	16.9	Natural Gas	16.9	Natural Gas	16.9	Natural Gas	16.9	Natural Gas	16.9	Natural Gas	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9
7	73.12	1	73.12	14.6	14.6	Natural Gas	14.6	Natural Gas	14.6	Natural Gas	14.6	Natural Gas	14.6	Natural Gas	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6	14.6
8	72.03	1	72.03	13.6	13.6	Natural Gas	13.6	Natural Gas	13.6	Natural Gas	13.6	Natural Gas	13.6	Natural Gas	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6
9	69.80	3	209.40	14.7	14.7	Natural Gas	14.7	Natural Gas	14.7	Natural Gas	14.7	Natural Gas	14.7	Natural Gas	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
10	74.83	3	224.59	14.2	14.2	Natural Gas	14.2	Natural Gas	14.2	Natural Gas	14.2	Natural Gas	14.2	Natural Gas	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2
11	50.79	4	203.16	19.0	19.0	Natural Gas	19.0	Natural Gas	19.0	Natural Gas	19.0	Natural Gas	19.0	Natural Gas	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
12	87.52	6	525.12	15.4	15.4	Natural Gas	15.4	Natural Gas	15.4	Natural Gas	15.4	Natural Gas	15.4	Natural Gas	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4
13	87	6	522	15.2	15.2	Natural Gas	15.2	Natural Gas	15.2	Natural Gas	15.2	Natural Gas	15.2	Natural Gas	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2
14	72.03	1	216.06	14.2	14.2	Natural Gas	14.2	Natural Gas	14.2	Natural Gas	14.2	Natural Gas	14.2	Natural Gas	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2
15	72.03	3	216.06	15.6	15.6	Natural Gas	15.6	Natural Gas	15.6	Natural Gas	15.6	Natural Gas	15.6	Natural Gas	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6
16	69.80	1	69.80	14.9	14.9	Natural Gas	14.9	Natural Gas	14.9	Natural Gas	14.9	Natural Gas	14.9	Natural Gas	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9	14.9
17	74.83	1	74.83	16.4	16.4	Natural Gas	16.4	Natural Gas	16.4	Natural Gas	16.4	Natural Gas	16.4	Natural Gas	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4
18	72.03	1	72.03	15.9	15.9	Natural Gas	15.9	Natural Gas	15.9	Natural Gas	15.9	Natural Gas	15.9	Natural Gas	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9	15.9
19	50.79	2	101.58	17.9	17.9	Natural Gas	17.9	Natural Gas	17.9	Natural Gas	17.9	Natural Gas	17.9	Natural Gas	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9	17.9
20	72.03	1	72.03	16.3	16.3	Natural Gas	16.3	Natural Gas	16.3	Natural Gas	16.3	Natural Gas	16.3	Natural Gas	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3
21	72.03	1	72.03	16.3	16.3	Natural Gas	16.3	Natural Gas	16.3	Natural Gas	16.3	Natural Gas	16.3	Natural Gas	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3
22	50.79	1	50.79	18.7	18.7	Natural Gas	18.7	Natural Gas	18.7	Natural Gas	18.7	Natural Gas	18.7	Natural Gas	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7	18.7
23	87.52	1	87.52	15.3	15.3	Natural Gas	15.3	Natural Gas	15.3	Natural Gas	15.3	Natural Gas	15.3	Natural Gas	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3
24	87	1	87	14.8	14.8	Natural Gas	14.8	Natural Gas	14.8	Natural Gas	14.8	Natural Gas	14.8	Natural Gas	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8	14.8
25	50.79	1	50.79	19.0	19.0	Natural Gas	19.0	Natural Gas	19.0	Natural Gas	19.0	Natural Gas	19.0	Natural Gas	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
26	87.52	1	87.52	16.0	16.0	Natural Gas	16.0	Natural Gas	16.0	Natural Gas	16.0	Natural Gas	16.0	Natural Gas	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0
27	87.52	1	87.52	16.0	16.0	Natural Gas	16.0	Natural Gas	16.0	Natural Gas	16.0	Natural Gas	16.0	Natural Gas	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0
28	87.52	1	87.52	16.0	16.0	Natural Gas	16.0	Natural Gas	16.0	Natural Gas	16.0	Natural Gas	16.0	Natural Gas	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0
29	87.52	1	87.52	16.0	16.0	Natural Gas	16.0	Natural Gas	16.0	Natural Gas	16.0	Natural Gas	16.0	Natural Gas	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0
30	87.52	1	87.52	16.0	16.0	Natural Gas	16.0	Natural Gas	16.0	Natural Gas	16.0	Natural Gas	16.0	Natural Gas	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0
31	72.03	1	72.03	15.6	15.6	Natural Gas	15.6	Natural Gas	15.6	Natural Gas	15.6	Natural Gas	15.6	Natural Gas	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15.6	15			

[illegible]

SAP 2012 Performance

SAP 10.0 Performance

Domestic

Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for domestic buildings

	Carbon Dioxide Emissions for domestic buildings (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	115.4	
After energy demand reduction (be lean)	105.9	
After heat network connection (be clean)	105.9	
After renewable energy (be green)	94.5	

Table 2: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for domestic buildings

	Regulated domestic carbon dioxide savings (Tonnes CO ₂ per annum)	
	(Tonnes CO ₂ per annum)	(%)
Be lean: savings from energy demand reduction	9.4	8%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	11.5	10%
Cumulative on site savings	20.9	18%
Annual savings from off-set payment	94.5	-
(Tonnes CO ₂)		
Cumulative savings for off-set payment	2,835	-
Cash in-lieu contribution (£)	289,286	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development Information' tab

Non-domestic

Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for non-domestic buildings

	Carbon Dioxide Emissions for non-domestic buildings (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	11.0	5.6
After energy demand reduction (be lean)	8.2	5.6
After heat network connection (be clean)	8.2	5.6
After renewable energy (be green)	7.5	5.6

Table 4: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for non-domestic buildings

	Regulated non-domestic carbon dioxide savings (Tonnes CO ₂ per annum)	
	(Tonnes CO ₂ per annum)	(%)
Be lean: savings from energy demand reduction	2.8	25%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.7	6%
Total Cumulative Savings	3.5	32%
Annual savings from off-set payment	7.5	-
(Tonnes CO ₂)		
Cumulative savings for off-set payment	226	-
Cash in-lieu contribution (£)	21,469	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development Information' tab

SITE-WIDE

	Total regulated emissions (Tonnes CO ₂ / year)	CO ₂ savings (Tonnes CO ₂ / year)	Percentage savings (%)
Part L 2013 baseline	126.3		
Be lean	114.2	12.2	10%
Be clean	114.2	0.0	0%
Be green	102.0	12.2	10%
Total Savings	-	24.3	19%
	-	CO ₂ savings off-set (Tonnes CO ₂)	-
Off-set	-	3,060.5	-

Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for domestic buildings

	Carbon Dioxide Emissions for domestic buildings (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	101.5	
After energy demand reduction (be lean)	89.2	
After heat network connection (be clean)	89.2	
After renewable energy (be green)	42.4	

Table 2: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for domestic buildings

	Regulated domestic carbon dioxide savings (Tonnes CO ₂ per annum)	
	(Tonnes CO ₂ per annum)	(%)
Be lean: Savings from energy demand reduction	12.4	12%
Be clean: Savings from heat network	0.0	0%
Be green: Savings from renewable energy	46.7	46%
Cumulative on site savings	59.1	58%
Annual savings from off-set payment	42.4	-
(Tonnes CO ₂)		
Cumulative savings for off-set payment	1,273	-
Cash in-lieu contribution (£)	120,893	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development Information' tab

Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for non-domestic buildings

	Carbon Dioxide Emissions for non-domestic buildings (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	5.6	5.6
After energy demand reduction (be lean)	4.2	5.6
After heat network connection (be clean)	4.2	5.6
After renewable energy (be green)	3.4	5.6

Table 4: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for non-domestic buildings

	Regulated non-domestic carbon dioxide savings (Tonnes CO ₂ per annum)	
	(Tonnes CO ₂ per annum)	(%)
Be lean: savings from energy demand reduction	1.4	25%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.8	14%
Total Cumulative Savings	2.2	40%
Annual savings from off-set payment	3.4	-
(Tonnes CO ₂)		
Cumulative savings for off-set payment	101	-
Cash in-lieu contribution (£)	9,634	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development Information' tab

	Total regulated emissions (Tonnes CO ₂ / year)	CO ₂ savings (Tonnes CO ₂ / year)	Percentage savings (%)
Part L 2013 baseline	107.1		
Be lean	93.3	13.8	13%
Be clean	93.3	0.0	0%
Be green	45.8	47.5	44%
Total Savings	-	61.3	57%
	-	CO ₂ savings off-set (Tonnes CO ₂)	-
Off-set	-	1,374.0	-

TABLE 1. DEVELOPMENT INFORMATION		NOTES
Date of Application		Please provide the date the application was submitted to the Local Planning Authority.
Local Planning Authority		Please indicate the Local Planning Authority determining the application.
Confirmed carbon offset price (£/tonne of carbon dioxide)		Please confirm the agreed carbon offset price for the Local Planning Authority. Evidence of communication on the price is expected to be included in the energy assessment. If no value is entered then the GLA's recommend price of £95 per tonne of carbon dioxide will be used.

TABLE 2. CARBON (CO ₂) FACTORS			NOTES
Fuel type	Fuel Carbon Factor (kgCO ₂ /kWh)		
	SAP 2012	SAP 10.0	
Natural Gas	0.216	0.210	SAP 2012 and SAP 10.0 carbon emission factors (Table 12).
Grid Electricity	0.519	0.233	
Enter Carbon Factor 1			These factors should be used where alternative fuel is used to grid gas and electricity. Carbon emission factors used here must be taken from Table 12 within the SAP 2012 and SAP 10.0 documents. Fuel type should be updated and referenced in Column A when additional carbon factor values have been added.
Enter Carbon Factor 2			
Enter Carbon Factor 3			
Enter Carbon Factor 4			
Bespoke DH Factor			This should only be used for non-domestic buildings that are connecting to District Heating (DH) networks. The network carbon factor should be calculated in line with Part L requirements and separate factors should be provided using SAP 2012 and SAP 10.0 fuel factors. Assumptions and workings should be shown below in Table 4.

TABLE 3. BESPOKE DH CARBON FACTOR CALCULATION METHODOLOGY
Please provide below details of the calculation methodology followed to establish the bespoke carbon factor, if applicable.

TABLE 4. DISTRIBUTION LOSSES			COMMENTS
Primary network (buried pipe)	Total pipe length (m)		
	Average heat loss rate (W/m)		
Secondary network (buried pipe)	Total pipe length (m)		
	Average heat loss rate (W/m)		
Total losses (MWh/year)			
Total heat supplied (MWh/year)			
Distribution Loss Factor (DLF)			
Calculation included in energy statement (yes/no)			

SAP 10.0 CO₂ PERFORMANCE

DOMESTIC ENERGY CONSUMPTION AND CO ₂ ANALYSIS																										
Unit identifier (e.g. plot number, dwelling type etc.)				REGULATED ENERGY CONSUMPTION PER UNIT (kWh p.a.) - TER WORKSHEET										REGULATED CO ₂ EMISSIONS PER UNIT (kgCO ₂ p.a.)						REGULATED CO ₂ EMISSIONS PER UNIT						
				Validation Check		TER 2012 (kgCO ₂ / m ²)		Space Heating	Fuel type Space Heating	Domestic Hot Water	Fuel type Domestic Hot Water	Lighting	Auxiliary	Cooling	Space Heating	Domestic Hot Water	Lighting	Auxiliary	Cooling	2012 CO ₂ emissions (kgCO ₂ p.a.)	Space Heating	Domestic Hot Water	Lighting	Auxiliary	Cooling	SAP 10.0 CO ₂ emissions (kgCO ₂ p.a.)
TER Worksheet (Row 4)				TER Worksheet (Row 273)		TER Worksheet (Row 211)	TER Worksheet (Row 219)	TER Worksheet (Row 232)	TER Worksheet (Row 231)	N/A																
103	72.77	1	72.77	19.1	19.1	3167.2573	Natural Gas	2330.9496	Natural Gas	327.9999	75	684	499	170	39	1,392	665	485	76	17				1,244	17.1	
104	73.52	1	73.52	18.0	18.0	2857.2358	Natural Gas	2326.2341	Natural Gas	323.3867	75	617	502	163	39	1,326	600	459	76	17				1,191	16.1	
105	50.79	1	50.79	18.5	18.5	1530.4515	Natural Gas	2074.7506	Natural Gas	243.3763	75	326	448	126	39	940	317	436	67	17				827	16.3	
106	50.79	1	50.79	19.6	19.6	1797.4262	Natural Gas	2067.2255	Natural Gas	236.1179	75	388	447	123	39	996	377	434	65	17				884	17.4	
107	70.06	1	70.06	19.5	19.5	3117.2354	Natural Gas	2239.9897	Natural Gas	324.2458	75	673	493	163	39	1,369	655	490	73	17				1,225	17.6	
108	50.9	1	50.9	20.6	20.6	2024.9294	Natural Gas	2061.9607	Natural Gas	243.9409	75	437	445	127	39	1,048	426	433	67	17				933	18.3	
109	50.75	1	50.75	20.9	20.9	2051.4224	Natural Gas	2058.3862	Natural Gas	243.1711	75	482	445	126	39	1,061	439	432	67	17				946	18.6	
110	72.42	1	72.42	19.7	19.7	3077.6898	Natural Gas	2320.3549	Natural Gas	327.9494	75	665	501	170	39	1,373	645	467	76	17				1,227	16.7	
111	72.77	1	72.77	19.9	19.9	3432.6252	Natural Gas	2307.6443	Natural Gas	328.1242	75	741	498	170	39	1,449	721	485	76	17				1,299	17.9	
112	72.77	3	218.31	20.4	20.4	3164.7524	Natural Gas	2304.5108	Natural Gas	328.1242	75	776	496	168	39	1,483	755	484	76	17				1,333	18.3	
113	73.52	3	220.56	16.1	16.1	2126.8937	Natural Gas	2341.0708	Natural Gas	323.3667	75	473	506	168	39	1,168	462	462	76	17				1,048	14.2	
114	50.79	4	203.16	16.4	16.4	1006.8308	Natural Gas	2083.7767	Natural Gas	243.3763	75	217	452	126	39	835	211	440	67	17				725	14.3	
115	50.79	6	304.14	19.8	19.8	1820.8614	Natural Gas	2065.6302	Natural Gas	243.3763	75	383	446	126	39	1,005	382	434	67	17				890	17.5	
116	50.79	6	304.74	16.6	16.6	1055.3725	Natural Gas	2081.6656	Natural Gas	243.3763	75	228	452	126	39	845	222	439	67	17				735	14.6	
117	73.52	3	220.56	16.1	16.1	1830.5836	Natural Gas	2351.5838	Natural Gas	323.3667	75	395	508	168	39	1,110	384	494	76	17				971	13.2	
118	72.77	3	218.11	16.8	16.8	2361.6213	Natural Gas	2327.6848	Natural Gas	328.1242	75	510	503	170	39	1,222	496	469	76	17				1,079	14.8	
119	72.77	1	72.77	17.2	17.2	2511.6303	Natural Gas	2323.3731	Natural Gas	328.1242	75	543	502	170	39	1,254	527	488	76	17				1,109	15.2	
120	73.52	1	73.52	16.9	16.9	2108.4238	Natural Gas	2341.2482	Natural Gas	323.3667	75	465	506	168	39	1,168	443	492	76	17				1,028	14.0	
121	50.79	1	50.79	16.4	16.4	1006.8308	Natural Gas	2081.7767	Natural Gas	243.3763	75	217	452	126	39	835	211	440	67	17				725	14.3	
122	50.79	1	50.79	16.6	16.6	1055.3725	Natural Gas	2081.6656	Natural Gas	243.3763	75	228	452	126	39	845	222	439	67	17				735	14.6	
123	50.79	3	101.58	16.6	16.6	1055.3725	Natural Gas	2081.6656	Natural Gas	243.3763	75	228	452	126	39	845	222	439	67	17				735	14.6	
124	73.52	1	73.52	15.1	15.1	1830.5836	Natural Gas	2351.5838	Natural Gas	323.3667	75	396	508	168	39	1,110	384	494	76	17				971	13.2	
125	72.77	1	72.77	18.7	18.7	3007.6368	Natural Gas	2314.5895	Natural Gas	328.1242	75	690	500	170	39	1,359	632	486	76	17				1,212	16.6	
126	50.79	1	50.79	18.7	18.7	1552.9796	Natural Gas	2075.3994	Natural Gas	243.3763	75	335	448	126	39	949	326	435	67	17				836	16.5	
131	73.52	1	73.52	17.0	17.0	2481.7385	Natural Gas	2334.4022	Natural Gas	323.3667	75	506	504	168	39	1,247	521	490	76	17				1,104	15.5	
135	50.79	1	50.79	17.8	17.8	1348.9321	Natural Gas	2081.2089	Natural Gas	236.1179	75	293	450	123	39	902	283	437	65	17				793	15.6	
136	72.77	1	72.77	19.1	19.1	3166.9821	Natural Gas	2330.9534	Natural Gas	328.1242	75	684	499	170	39	1,392	665	485	76	17				1,244	17.1	
137	73.52	1	73.52	17.9	17.9	2791.8486	Natural Gas	2307.522	Natural Gas	323.3667	75	601	503	168	39	1,313	586	489	75	17				1,168	15.9	
138	50.79	1	50.79	18.5	18.5	1520.5716	Natural Gas	2074.7468	Natural Gas	243.3763	75	326	448	126	39	940	317	436	67	17				827	16.3	
139	50.79	1	50.79	19.6	19.6	1797.4262	Natural Gas	2067.2322	Natural Gas	236.1179	75	388	447	123	39	996	377	434	65	17				884	17.4	
Sum	3,175	52	3,175	17.8	-	102,679	N/A	114,076	N/A	14,601	3,900	0	22,157	24,641	7,878	2,024	0	56,400	21,642	23,996	3,402	909	0	49,808	15.7	
NON-DOMESTIC ENERGY CONSUMPTION AND CO ₂ ANALYSIS																										
Building Use				Validation Check		REGULATED ENERGY CONSUMPTION BY END USE (kWh/m ² p.a.) TER - SOURCE: BRUKL OUTPUT						REGULATED ENERGY CONSUMPTION BY FUEL TYPE (kWh/m ² p.a.) TER - SOURCE: BRUKL INP or BIM CSV FILE			REGULATED ENERGY CONSUMPTION BY FUEL TYPE (kWh/m ² p.a.) TER BRUKL				REGULATED CO ₂ EMISSIONS							
				Calculated TER 2012 (kgCO ₂ / m ²)	BRUKL TER 2012 (kgCO ₂ / m ²)	Space Heating (kWh/m ² p.a.)	Fuel type Space Heating	Domestic Hot Water (kWh/m ² p.a.)	Fuel type Domestic Hot Water	Lighting (kWh/m ² p.a.)	Auxiliary (kWh/m ² p.a.)	Cooling (kWh/m ² p.a.)	Natural Gas	Grid Electricity	Equipment	Natural Gas	Grid Electricity	Unregulated Grid Electricity	SAP 10.0 CO ₂ emissions (kgCO ₂ p.a.)	Calculated TER SAP 10.0 (kgCO ₂ / m ²)						
Sum	0	0	0	0.0	-	0	0	N/A	0	N/A	0	0	0	0	0	0	0	0	0	0	0	N/A	N/A	0	0.0	
SITE-WIDE ENERGY CONSUMPTION AND CO ₂ ANALYSIS																										
Use				Total Area (m ²)	Calculated TER 2012 (kgCO ₂ / m ²)	-	REGULATED ENERGY CONSUMPTION						REGULATED CO ₂ EMISSIONS						REGULATED CO ₂ EMISSIONS PER UNIT							
							Space Heating (kWh p.a.)	N/A	Domestic Hot Water (kWh p.a.)	N/A	Lighting (kWh p.a.)	Auxiliary (kWh p.a.)	Cooling (kWh p.a.)	2012 CO ₂ emissions (kgCO ₂ p.a.)			SAP 10.0 CO ₂ emissions (kgCO ₂ p.a.)			Calculated TER SAP 10.0 (kgCO ₂ / m ²)						
Sum		3,175		17.8	-	102,679			114,076		14,601	3,900	0	56,400			49,808			15.7						

SAP 2012 CO₂ PERFORMANCE

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CO ₂ EMISSIONS PER UNIT (kgCO ₂ p.a.)				REGULATED CO ₂ EMISSIONS PER UNIT									
Lighting CO ₂ emissions (kgCO ₂ p.a.)	Auxiliary CO ₂ emissions (kgCO ₂ p.a.)	Cooling CO ₂ emissions (kgCO ₂ p.a.)	2012 CO ₂ emissions (kgCO ₂ p.a.)	Space Heating CO ₂ emissions (kgCO ₂ p.a.)	Domestic Hot Water CO ₂ emissions (kgCO ₂ p.a.)	Lighting CO ₂ emissions (kgCO ₂ p.a.)	Auxiliary CO ₂ emissions (kgCO ₂ p.a.)	Cooling CO ₂ emissions (kgCO ₂ p.a.)	Unregulated (kgCO ₂ p.a.)	SAP 10.9 CO ₂ emissions (kgCO ₂ p.a.)	Calculated DER SAP 10.9 (kgCO ₂ /m ²)		
167	109		1,264	474	506	75	49		593	1,164	16.2		
168	109		1,234	423	507	75	49		590	1,095	14.3		
124	78		874	203	451	55	35		435	744	14.7		
132	79		927	256	451	55	35		435	796	15.7		
161	119		1,248	441	500	72	53		566	1,068	15.2		
124	88		978	294	451	56	39		436	840	16.5		
123	90		1,110	421	451	40	50		435	867	15.1		
169	123		1,237	432	507	75	55		587	1,070	14.6		
167	111		1,262	538	506	75	50		593	1,160	16.1		
167	112		1,380	665	506	75	50		583	1,196	16.4		
168	106		1,029	266	507	75	49		588	896	12.2		
124	75		764	98	451	34	55		435	638	12.6		
124	79		841	248	451	55	35		435	789	15.5		
124	78		773	107	451	55	34		435	647	12.7		
168	106		1,025	224	507	47	75		585	854	11.6		
167	106		1,129	326	506	75	48		583	955	13.1		
167	107		1,153	349	506	48	75		583	978	13.4		
168	106		1,051	249	507	75	47		588	879	12.0		
124	75		764	98	451	55	34		435	638	12.6		
124	76		773	107	451	34	55		435	647	12.7		
124	76		773	107	451	55	34		435	647	12.7		
168	109		1,025	224	507	47	75		585	854	11.6		
167	109		1,257	448	506	75	49		583	1,078	14.8		
124	78		880	209	451	55	35		435	750	14.0		
168	108		1,159	352	507	48	75		583	953	13.4		
122	77		840	172	451	55	35		435	712	14.0		
167	109		1,284	473	506	75	49		593	1,103	15.2		
168	109		1,202	382	507	75	49		585	1,024	13.9		
124	78		874	203	451	55	35		435	744	14.7		
132	79		927	256	451	55	35		435	797	15.7		
7,472	4,786	0	52,024	13,894	24,768	3,354	2,149	0	26,205	44,163	13.9		

[illegible]

	REGULATED CO ₂ EMISSIONS		REGULATED CO ₂ EMISSIONS	
	2012 CO ₂ emissions (kgCO ₂ p.a.)		SAP 10.8 CO ₂ emissions (kgCO ₂ p.a.)	Calculated BER SAP 10.8 (kgCO ₂ / m ²)
	52,024		44,165	13.9

DOMESTIC ENERGY CONSUMPTION AND CO ₂ ANALYSIS																																				
REGULATED ENERGY CONSUMPTION PER UNIT (kWp p.a.) - BE CLEAR SAP DER WORKSHEET																																				
Unit identifier (incl. plot number, dwelling type etc.)	Model total floor area (m ²)	Number of units	Total area represented by model (m ²)	VALIDATION CHECK			REGULATED ENERGY CONSUMPTION PER UNIT (kWp p.a.) - BE CLEAR SAP DER WORKSHEET										REGULATED CO ₂ EMISSIONS PER UNIT (kgCO ₂ p.a.)																			
				Calculated DER 2012 (kgCO ₂ /m ²)	DER Worksheet DER 2012 (kgCO ₂ /m ²)	Space Heating (Heat Source 1)	Fast type Space Heating	Domestic Hot Water (Heat Source 1)	Fast type Domestic Hot Water	Space and Domestic Hot Water from CHP	Fast type CHP	Total Electricity generated by CHP (kWh p.a.)	Secondary Heating system	Fast type Secondary Heating	Lighting	Auxiliary	Cooling	2012 CO ₂ emissions (kgCO ₂ p.a.)	Space Heating	Domestic Hot Water	Space Heating and DHW from CHP	Electricity generated by CHP	Lighting	Auxiliary	Cooling											
DER Sheet (Row 245)				DER Sheet (Row 245)		Select fast type	DER Sheet (Row 245)	Select fast type	DER Sheet (Row 245)	Select fast type	DER Sheet (Row 245)	Select fast type	DER Sheet (Row 245)	Select fast type	DER Sheet (Row 245)	DER Sheet (Row 245)	DER Sheet (Row 245)																			
						If applicable		If applicable		If applicable		If applicable		If applicable		If applicable																				
						If applicable		If applicable		If applicable		If applicable		If applicable		If applicable																				
						If applicable		If applicable		If applicable		If applicable		If applicable		If applicable																				
						If applicable		If applicable		If applicable		If applicable		If applicable		If applicable																				
						If applicable		If applicable		If applicable		If applicable		If applicable		If applicable																				
						If applicable		If applicable		If applicable		If applicable		If applicable		If applicable																				
						If applicable		If applicable		If applicable		If applicable		If applicable		If applicable																				
						If applicable		If applicable		If applicable		If applicable		If applicable		If applicable																				
						If applicable		If applicable		If applicable		If applicable		If applicable		If applicable																				

The applicant should complete all the light blue cells including information on the 'be green' energy consumption figures and the 'be green' DER.

[illegible]

SAP 2012 Performance

SAP 10.0 Performance

Domestic

Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for domestic buildings

	Carbon Dioxide Emissions for domestic buildings (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	56.4	
After energy demand reduction (be lean)	52.0	
After heat network connection (be clean)	52.0	
After renewable energy (be green)	42.0	

Table 2: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for domestic buildings

	Regulated domestic carbon dioxide savings (Tonnes CO ₂ per annum)	
	(Tonnes CO ₂ per annum)	(%)
Be lean: savings from energy demand reduction	4.4	8%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	10.1	18%
Cumulative on site savings	14.4	26%
Annual savings from off-set payment	42.0	-
(Tonnes CO ₂)		
Cumulative savings for off-set payment	1,289	-
Cash in-lieu contribution (£)	119,605	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development Information' tab

Non-domestic

Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for non-domestic buildings

	Carbon Dioxide Emissions for non-domestic buildings (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	0.0	
After energy demand reduction (be lean)	0.0	
After heat network connection (be clean)	0.0	
After renewable energy (be green)	0.0	

Table 4: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for non-domestic buildings

	Regulated non-domestic carbon dioxide savings (Tonnes CO ₂ per annum)	
	(Tonnes CO ₂ per annum)	(%)
Be lean: savings from energy demand reduction	0.0	0%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.0	0%
Total Cumulative Savings	0.0	0%
Annual savings from off-set payment	0.0	-
(Tonnes CO ₂)		
Cumulative savings for off-set payment	0	-
Cash in-lieu contribution (£)	0	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development Information' tab

SITE-WIDE

	Total regulated emissions (Tonnes CO ₂ / year)	CO ₂ savings (Tonnes CO ₂ / year)	Percentage savings (%)
Part L 2013 baseline	56.4		
Be lean	52.0	4.4	8%
Be clean	52.0	0.0	0%
Be green	42.0	10.1	18%
Total Savings	-	14.4	26%
	-	CO ₂ savings off-set (Tonnes CO ₂)	-
Off-set	-	1,289.0	-

Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for domestic buildings

	Carbon Dioxide Emissions for domestic buildings (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	49.8	
After energy demand reduction (be lean)	44.2	
After heat network connection (be clean)	44.2	
After renewable energy (be green)	18.8	

Table 2: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for domestic buildings

	Regulated domestic carbon dioxide savings (Tonnes CO ₂ per annum)	
	(Tonnes CO ₂ per annum)	(%)
Be lean: Savings from energy demand reduction	5.6	11%
Be clean: Savings from heat network	0.0	0%
Be green: Savings from renewable energy	25.3	51%
Cumulative on site savings	31.0	62%
Annual savings from off-set payment	18.8	-
(Tonnes CO ₂)		
Cumulative savings for off-set payment	665	-
Cash in-lieu contribution (£)	63,695	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development Information' tab

Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for non-domestic buildings

	Carbon Dioxide Emissions for non-domestic buildings (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	0.0	
After energy demand reduction (be lean)	0.0	
After heat network connection (be clean)	0.0	
After renewable energy (be green)	0.0	

Table 4: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for non-domestic buildings

	Regulated non-domestic carbon dioxide savings (Tonnes CO ₂ per annum)	
	(Tonnes CO ₂ per annum)	(%)
Be lean: savings from energy demand reduction	0.0	0%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.0	0%
Total Cumulative Savings	0.0	0%
Annual savings from off-set payment	0.0	-
(Tonnes CO ₂)		
Cumulative savings for off-set payment	0	-
Cash in-lieu contribution (£)*	0	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development Information' tab

	Total regulated emissions (Tonnes CO ₂ / year)	CO ₂ savings (Tonnes CO ₂ / year)	Percentage savings (%)
Part L 2013 baseline	49.8		
Be lean	44.2	5.6	11%
Be clean	44.2	0.0	0%
Be green	18.8	25.3	51%
Total Savings	-	31.0	62%
	-	CO ₂ savings off-set (Tonnes CO ₂)	-
Off-set	-	665.2	-

Appendix C Limitations Page

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