

LOVE DESIGN STUD/O

ENERGY AND SUSTAINABILITY STATEMENT

160 Malden Road
by Love Design Studio

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PR455_V0

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CONTENTS

Executive Summary	3
Introduction	4
Energy and Sustainability Planning Policy	5
Methodology & Assumptions	8
Demand Reduction (Be Lean)	9
Heat Supply (Be Clean)	13
Renewable Energy (Be Green)	14
Monitor Energy (Be seen)	17
Carbon Emission Results Summary	18
Sustainability and Climate Change Appraisal	20
Conclusion	25
Appendix A– DER/TER Worksheets	26

EXECUTIVE SUMMARY

An assessment of the site’s sustainability and energy credentials has been carried out for 160 Malden Road, London, NW5 4BS.

The proposal is to demolish the existing buildings on site and to deliver a 4-storey development consisting of a commercial unit on the ground floor and 15 residential units spread across the ground and upper floors.

The energy strategy follows the energy hierarchy; Use Less Energy (Be Lean), Supply energy efficiently (Be Clean) and use Renewable and low carbon energy (Be Green) as per Policy CCI of the Camden Local Plan (2017).

The scheme adopts a fabric-first and passive design approach to reduce energy demand for space heating and eliminate the need for active cooling. Key design elements of the proposals comprise of:

- Window reveals, balconies, and internal blinds, where feasible
- A well-insulated building fabric shell
- Being airtight, reducing draughts and heat-loss.
- Mechanical ventilation with heat recovery (MVHR)

An all-electric, air source heat-pump system is proposed to deliver the space heating and hot water demand for this scheme. ASHPs offer a highly energy efficient low carbon solution, that future-proofs the dwelling towards achieving net zero carbon in operation in coming years. Low operational costs and carbon emissions, are complemented with improved air quality on-site due to zero combustion on site, benefitting the health & wellbeing of occupants.

Based on the assessment undertaken, the energy strategy set out within this report delivers the following:

- Domestic regulated CO₂ savings of 10 tonnes per annum and a CO₂ reduction of 57% compared to the baseline
- Non-domestic regulated CO₂ savings of 1 tonne per annum and a CO₂ reduction of 42% compared to the baseline
- **On-site cumulative regulated CO₂ savings of 12 tonnes and a CO₂ reduction of 57% compared to the baseline.**

The site-wide results summary for the carbon emissions are set out to the right. Further detail may be found in the body of the report.

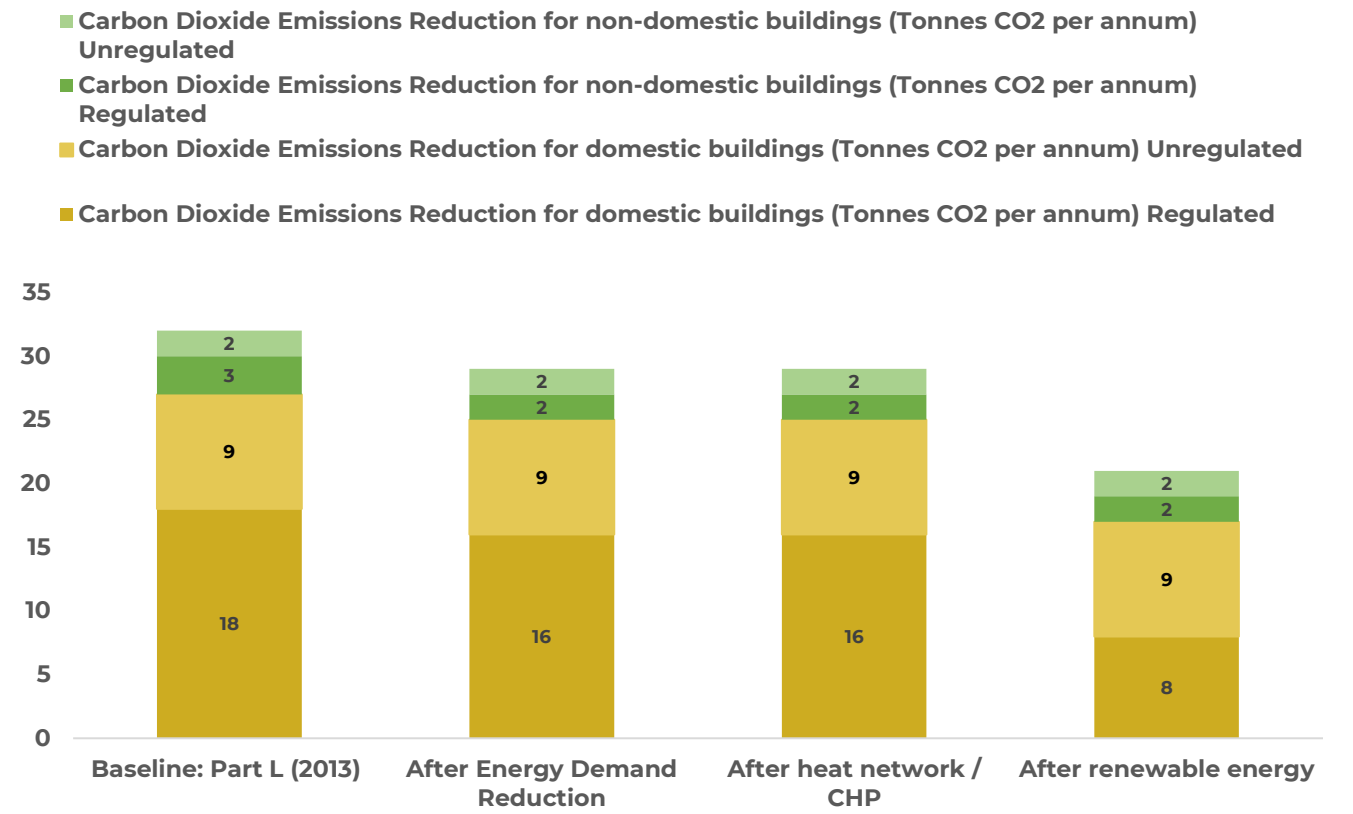


Figure 1: Total site-wide savings at each stage of the energy hierarchy

Table 1: Total site-wide savings at each stage of the energy hierarchy

Energy Hierarchy stage	Regulated domestic carbon dioxide savings		Regulated non-domestic carbon dioxide savings	
	(Tonnes CO ₂ per annum)	(%)	(Tonnes CO ₂ per annum)	(%)
Savings from energy demand reduction	3	14%	1	30%
Savings from heat network / CHP	0	0%	0	0%
Savings from renewable energy	8	35%	1	12%
Cumulative on-site savings	10	57%	1	42%

Emissions within this report are based on the following CO₂ emission rates:

- Natural Gas 0.210 kgCO₂/kWh
- Grid electricity 0.233 kgCO₂/kWh

These represent the SAP 10 carbon factor figures. For the assessment of demand reduction measures (Be Lean stage) space heating and domestic hot water is assumed to be from gas boilers at this stage with an 89.5% efficient gas boiler, to standardize a benchmark target. However, the Be Green stage of the energy hierarchy results considers air-source heat pumps as an alternative method for space heating and hot water.

INTRODUCTION

Love Design Studio have been appointed to prepare this energy and sustainability statement for the proposed development at 160 Malden Road London, NW5 4BS. The scheme is within the jurisdiction of the London Borough of Camden.

The proposal is to demolish the existing buildings on site and to deliver a 4-storey development consisting of a commercial unit on the ground floor and 15 residential units spread across the ground and upper floors.

The purpose of this statement is to outline the sustainability credentials of the scheme and demonstrate the alignment of the proposed energy strategy with relevant national, regional, and local planning policy requirements.



Figure 2: Image of Existing Site (160 Malden Road, Red)

ENERGY AND SUSTAINABILITY PLANNING POLICY

The local authority, London Borough of Camden, have a statutory duty to guide development within the borough and use policies and guides to do so. The London Borough of Camden adopted the Local Plan as a development plan document (DPD) on 3rd July 2017. The Camden Local Plan sets out the planning strategy and policies for the borough until 2031 and includes an appendix which will appear on the Policies Map.

The sustainability elements from the National Planning Policy Framework (NPPF), London Plan (2021), and Local Plan (2017) are set out in the following sub-sections.

NATIONAL PLANNING POLICY

The National Planning Policy Framework sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally prepared plans for housing and other development can be produced.

Planning law requires that applications for planning permission be determined in accordance with the development plan unless material considerations indicate otherwise. The National Planning Policy Framework must be considered in preparing the development plan and is a material consideration in planning decisions. Planning policies and decisions must also reflect relevant international obligations and statutory requirements.

The purpose of the planning system is to contribute to the achievement of sustainable development. In summary the framework advises:

"Plans should take a proactive approach to mitigating and adapting to climate change, considering the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure.

New development should be planned for in ways that:

- 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
- 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.

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

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

REGIONAL PLANNING POLICY

The London Plan, published in 2021, is the overall strategic plan for London which sets out an integrated economic, environmental, and social framework for the development of London over the next 20-25 years.

THE LONDON PLAN (2021)

Under the legislation establishing the Greater London Authority (GLA), the Mayor is required to publish a Spatial Development Strategy (SDS) and keep it under review. The London Plan, published in 2021, is the overall strategic plan for London which sets out an integrated economic, environmental, and social framework for the development of London over the next 20-25 years.

The document brings together the geographical and locational aspects of the Mayor's other strategies, to ensure consistency with those strategies, including those dealing with transport, environment, economic development, housing, culture, and health inequalities.

The energy strategy for this scheme follows the energy hierarchy written in the key policy below.

POLICY SI 2 MINIMISING GREENHOUSE GAS EMISSIONS

Policy SI 2 relates to major developments which follows the energy hierarchy below:

1. Be Lean - use less energy and manage demand during operation.

2. Be Clean - exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly.

3. Be Green - maximise opportunities for renewable energy by producing, storing, and using renewable energy on-site.

4 Be Seen - monitor, verify and report on energy performance.

Other policy extracts from the London Plan that are deemed relevant to Energy and/or Sustainability have been set out below for reference:

POLICY SI 1 IMPROVING AIR QUALITY

POLICY SI 3 ENERGY INFRASTRUCTURE

POLICY SI 4 MANAGING HEAT RISK

POLICY SI 5 WATER INFRASTRUCTURE

POLICY SI7 REDUCING WASTE AND SUPPORTING THE CIRCULAR ECONOMY

LOCAL POLICY

Policy within the Borough of Camden is formed of the Camden Local Plan (2017) and it is the key document in Camden's development plan which is a group of documents that set out Council's planning policies.

In November 2019, the council declared a climate and ecological emergency, committing to achieving zero carbon emissions. Council planning policies include requirements relating to carbon reduction, flood risk measures, cycle parking and biodiversity improvements.

The Council aims to tackle the causes of climate change in the borough by ensuring developments use less energy and assess the feasibility of decentralised energy and renewable energy technologies. Camden Planning Guidance (CPG) is prepared by the Council on Energy and resources to support the policies in the Camden Local Plan 2017. It provides key energy and resource issues within the borough and supports following policies.

LOCAL PLAN (2017)

Policy extracts that are deemed relevant to Energy and/or Sustainability have been set out below for reference:

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.

The council will:

- a. promote zero carbon development and require all development to reduce carbon dioxide emissions through following the steps in the energy hierarchy;*
- b. require all major development to demonstrate how London Plan targets for carbon dioxide emissions have been met;*
- c. ensure that the location of development and mix of land uses minimise the need to travel by car and help to support decentralised energy networks;*
- d. support and encourage sensitive energy efficiency improvements to existing buildings;*
- e. require all proposals that involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building; and*
- f. expect all developments to optimise resource efficiency.*

POLICY CC2: ADAPTING TO CLIMATE CHANGE

POLICY CC3: WATER AND FLOODING

POLICY CC4: AIR QUALITY

POLICY CC5: WASTE

POLICY C1: HEALTH AND WELLBEING

METHODOLOGY & ASSUMPTIONS

METHODOLOGY

Following the new Part L 2021 Building Regulations that came into effect in June 2022, the GLA Energy Assessment Guidance (June 2022) states that major non-domestic developments must meet a 35 per cent on-site carbon reduction beyond Part L 2021. However, as the software is currently in an interim period between Part L 2013 and Part L 2021 that is yet to be tried and tested, the GLA have stated the following:

“However, as the accompanying Part L 2021 software is not yet available, planning applicants should continue to use the 2020 guidance, spreadsheet and the Part L 2013 methodology until the software has been approved by government and is fully functional.”

Therefore, this energy assessment has proceeded using the 2013 methodology by running SAP and SBEM calculations against Part L 2013 carbon factors and notional baselines. The outputs were then used in the GLA Carbon Emissions Reporting Spreadsheet 2020 which uses Part L 2013 as a baseline.

ASSUMPTIONS

To achieve compliance with the energy and sustainability policy contained in the Camden Local Plan (2017) and to consider future policy, the following assumptions, definitions, and methodology have been undertaken:

- Compliant SAP software has been used to calculate the carbon dioxide emissions for the scheme using SAP 2012 carbon factors which are then converted using SAP 10 carbon factors.
- On-site carbon emission reductions are to be at least in-line with the latest Building Regulations document with consideration of future updates.
- Completed checklists at this stage represent anticipated targets, post construction testing will be required to confirm airtightness, ventilation, and thermal bridging
- Building fabric product specification will aim to adhere to the proposed target U-values as per minimum and further efficiencies will be sought where feasible. As-built U-values will be confirmed at project completion based on manufacturers' data.
- For the purposes of this report, heat pump technology is considered as "renewable" with impacts assessed under the "Be Green" stage of the Energy Hierarchy.
- As the majority of the proposed scheme is domestic, assumptions were made of the energy strategy for the non-domestic part, being the use of Air Source Heat Pumps and Mechanical Extract Ventilation.
- Drawings used to model the scheme are based on the drawings prepared by Piotr Garstecki (received 24th April 2022).

DEMAND REDUCTION (BE LEAN)

Passive design measures, including optimising orientation and site layout, natural ventilation and lighting, thermal mass and solar shading are set out in this document. Active design measures, including high efficiency lighting and efficient low-energy extract systems, are also set out below. Building fabric details are set out in the tables at the end of this section (SAP 2012 carbon factor figures have been used throughout this assessment and then converted using SAP 10 carbon factors).



Building Insulation

Standard insulation materials are typically constructed from petrochemicals and include fibreglass, mineral wool, polystyrene, polyurethane foam, and multi-foils. These materials are typically inexpensive to both buy and install. However, these insulation materials contain many additives, and their process embodied energy is higher than natural insulation. Natural insulation products are typically defined as low impact to nature, generally being organic resources that have low embodied energy. They can be reused and recycled and are usually biodegradable. They tend to be more absorbent properties than standard man-made insulation materials reducing condensation issues.

Thermal conductivity can be defined as the rate at which heat is transferred by conduction through a unit cross-section area of a material; the lower the thermal conductivity of the insulation materials the lower the rate at which one adjoining space will have on its partying wall, roof, or floor. This scheme will provide building insulation U-values improved upon the Building Regulations standard. At the detailed design stage both standard and natural insulation materials will be considered on merit, feasibility, and pricing.



Thermal mass

Thermal mass is related to materials and the ability to absorb and store heat. High density materials like concrete, bricks and tiles require more energy to heat up; they are therefore considered to have high thermal mass. Lightweight materials such as timber have low thermal mass. For residential uses thermal mass is not commonly deemed to be the most reliable form of controlling heat build-up within spaces as heat may build-up during the day in bedrooms during summer and may then be exhausted during the occupants sleeping period; therefore, for the SAP calculations the assumption of the thermal mass parameter is 'medium' (250 kJ/m²K).



Orientation & Site layout

Orientation of dwellings is key in maximising the benefits of solar gain in the winter and improving daylight & sunlight access given the constraints of the site. Single aspect, south and southwest facing spaces should be minimised unless overheating mitigation measures are present.

The scheme is predominantly north and south facing allowing for cross-ventilation. Dual aspect facades are utilised, where possible, to promote better daylight and sunlight access. Facades also have significant opportunity for daylight and sunlight access to each dwelling. Additionally, this scheme utilises south-facing balconies to reduce the requirement for active cooling.



Thermal Bridge Summary

Thermal Bridges (Linear) occur at junctions between elements, such as a wall and a floor or a window and a wall. At these locations heat can transfer more through the construction, resulting in greater heat loss from the dwelling and localised 'cold spots' in the building envelope. Improving junction details to reduce linear thermal bridging will help achieve Building Regulations compliance and in achieving healthy low energy homes.

The following thermal junction types within the scheme and should either meet the Accredited Construction Details (ACDs) or be tested at the detailed design stage:

- E2 Other lintels
- E3 Sill
- E4 Jamb
- E5 Ground floor (normal)
- E6 Intermediate floor within a dwelling
- E10 Eaves (insulation at ceiling level)
- E11 Eaves (insulated at rafter level)
- E12 Gable (insulation at ceiling level)
- E13 Gable (insulated at rafter level)
- E14 Flat Roof
- E16 Corner (normal)
- E17 Corner (inverted)
- E25 Staggered party wall between dwellings



Lighting

Within the property, all fixed light fittings will be low-energy lamps, including storage and infrequently accessed areas. The lux levels within each space will be designed to match relevant Building Regulations and industry guidance to reduce the requirement for additional unregulated lighting.

Poorly lit areas can strain the eyes and increase the reliance of subsidiary lighting such as inefficient unregulated lamps. Health and wellbeing is proven to be linked to access to daylight and sunlight. Furthermore, inefficient lighting can lead to increased energy bills.

The lighting to rooms used less frequently, will be provided with PIR movement detectors and daylight control where appropriate.

 Natural Ventilation

Natural ventilation is a method of supplying fresh air to a space through passive means, typically by utilising differences in pressure and/or temperatures within a space.

The key for residential uses is to minimise the complexity of ventilation strategies; otherwise, the occupant may not manage the strategy appropriately.

All windows to habitable rooms will be openable to allow for maximum dispersion of heat and pollution build-up such as CO₂.

Cross-ventilation capitalises on the opportunity for dissipation of heat and CO₂ build-up through wind and pressure differences across the building.

 Mechanical Ventilation with Heat Recovery (MVHR)

Although passive ventilation should be maximised during temperate conditions, as this requires no fan power, there is the potential for heat to be lost to the atmosphere when fresh air is required (from opening windows) simultaneously with heating during colder seasons; therefore, it is advantageous to provide a form of heat recovery that allows for an efficient system that captures the heat exhausting from a room being heated in colder conditions.

The dwellings will have mechanical ventilation heat recovery (MVHR) systems offering fresh air supply to bedroom and living room spaces and extract from the kitchen and bathrooms; meaning windows will not be required to be open to meet the minimum background ventilation rates. The heat recovery aspect will lower space heating consumption. A summer by-pass mode will allow for extracting of heat build-up during hotter periods



Figure 3: © Titon image of a typical MVHR unit

 Solar shading

The scheme will utilise window reveals, balconies, and internal blinds, where feasible, to reduce the requirement for active cooling. The dwellings will be capable of utilising passive opening methods for ventilation purposes; in most cases capitalising on cross-ventilation.

The scheme meets the minimum required targets for heat control within Building Regulations Approved Document Part L.

Lateral hot-water pipework runs will be minimised to avoid heat loss; where there is hot water pipework and/or heat exchangers, these will be fully insulated.

Solar shading techniques to reduce the impact of increased temperatures in habitable spaces are set out in the tables below:

Table 2: The scheme overheating mitigation measures

Overheating Mitigation Measures	
1. Minimising Internal Heat	Pipe lengths minimised, insulated pipework.
2. Reducing heat entering	Balconies, internal blinds, ~80mm window reveals
3. Use of thermal mass	Not suitable
4. Passive ventilation	Openable windows, dual aspect (where feasible)
5. Mechanical ventilation	Mechanical Ventilation with Heat Recovery, Approved Inspector
6. Active cooling	None

Passive Design Measures Summary

Overleaf sets out the inputs used for the SAP calculations to generate carbon emission reduction findings.

In summary, the scheme benefits from:

- An orientation that suits daylight and sunlight access.
- Being airtight, reducing draughts and heat-loss.
- A well-insulated building fabric shell.
- MVHR.
- 100% efficient lighting.
- Passive solar shade solutions.

The Dwelling Fabric Energy Efficiency (DFEE) rating is greater than an 11% improvement upon building regulations standards (Table 5).

For the assessment of demand reduction measures (Table 5) space heating and domestic hot water is assumed to be from a gas boiler to standardise a benchmark target.

Table 3: The SAP model input variables for reference

Whole Scheme Technical Information			
Building Fabric	Input	Unit	Comment
External Wall U-value	0.14	W/m2K	Include unheated areas
Roof U-value	0.12	W/m2K	Include roof to terraces
Ground Floor U-value	0.12	W/m2K	-
Windows U-value	1.2	W/m2K	-
Domestic Technical Information			
Building Fabric	Input	Unit	Comment
Windows g-value	0.63	-	-
Frame-Factor	0.7	-	-
Thermal Mass Parameter	Medium (250 kJ/m²K)		Default value
Thermal Bridge Y-value	<0.1	-	Thermal Bridging calculations to be carried out Post-Planning.
Ventilation Method	Nuaire MRXBOXAB-ECO3		Mechanical Ventilation with Heat Recovery, Approved Inspector
System Assumptions			All wet rooms and kitchens
Air permeability	3.0 @50Pa (m.h3/m2)		A low air permeability required to improve mech vent efficiency

Table 4: The scheme overheating mitigation measures

Overheating Mitigation Measures	
1. Minimising Internal Heat	Pipe lengths minimised, insulated pipework.
2. Reducing heat entering	Balconies, internal blinds, ~80mm window reveals
3. Use of thermal mass	-
4. Passive ventilation	Openable windows, dual aspect (where feasible)
5. Mechanical ventilation	Mechanical Ventilation with Heat Recovery, Approved Inspector
6. Active cooling	None

Demand figures are set out in the table below.

Table 5: Area weighted Fabric Energy Efficiency ratings for the domestic portion of the development

	TFEE (kWh/m²)	DFEE (kWh/m²)	Improvement (%)
Development total	52.47	46.62	11%

HEAT SUPPLY (BE CLEAN)

Once demand for energy has been minimised, planning applications should demonstrate how their energy systems will exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly to reduce CO₂ emissions.

As well as carbon dioxide emissions, all combustion processes can emit oxides of Nitrogen (NO_x) and, solid or liquid fuelled appliances (such as those using biomass or biodiesel) can also emit Particulate Matter. These pollutants contribute to poor air quality and can have negative impacts on the health of residents and occupiers of the development. It is important that these impacts are considered in determining the heating strategy of a development.

Existing Networks, Planned Networks and Supplying heat beyond the site boundary

Where a heat network exists in the vicinity of the proposed development, the applicant should look to prioritise connection and provide evidence of active two-way correspondence with the network operator.

Applicants should investigate the potential for connecting the development to an existing heat network system by contacting the local borough, local heat network operators and nearby developments.

If there is not an existing network, the applicant must investigate whether a network is being planned for the area. Applicants should also investigate opportunities for expanding their heat network to supply heat to local developments and buildings outside the boundaries of their site, particularly if this has the potential to facilitate an area-wide heat network. The scheme is located at too greater distance from any existing or proposed heat networks., as shown in Figure 4 Heating demand is considered low due to the quality building fabric; therefore, individual efficient space heating and domestic hot water systems are advised.

There are no CO₂ savings at this stage of the energy hierarchy

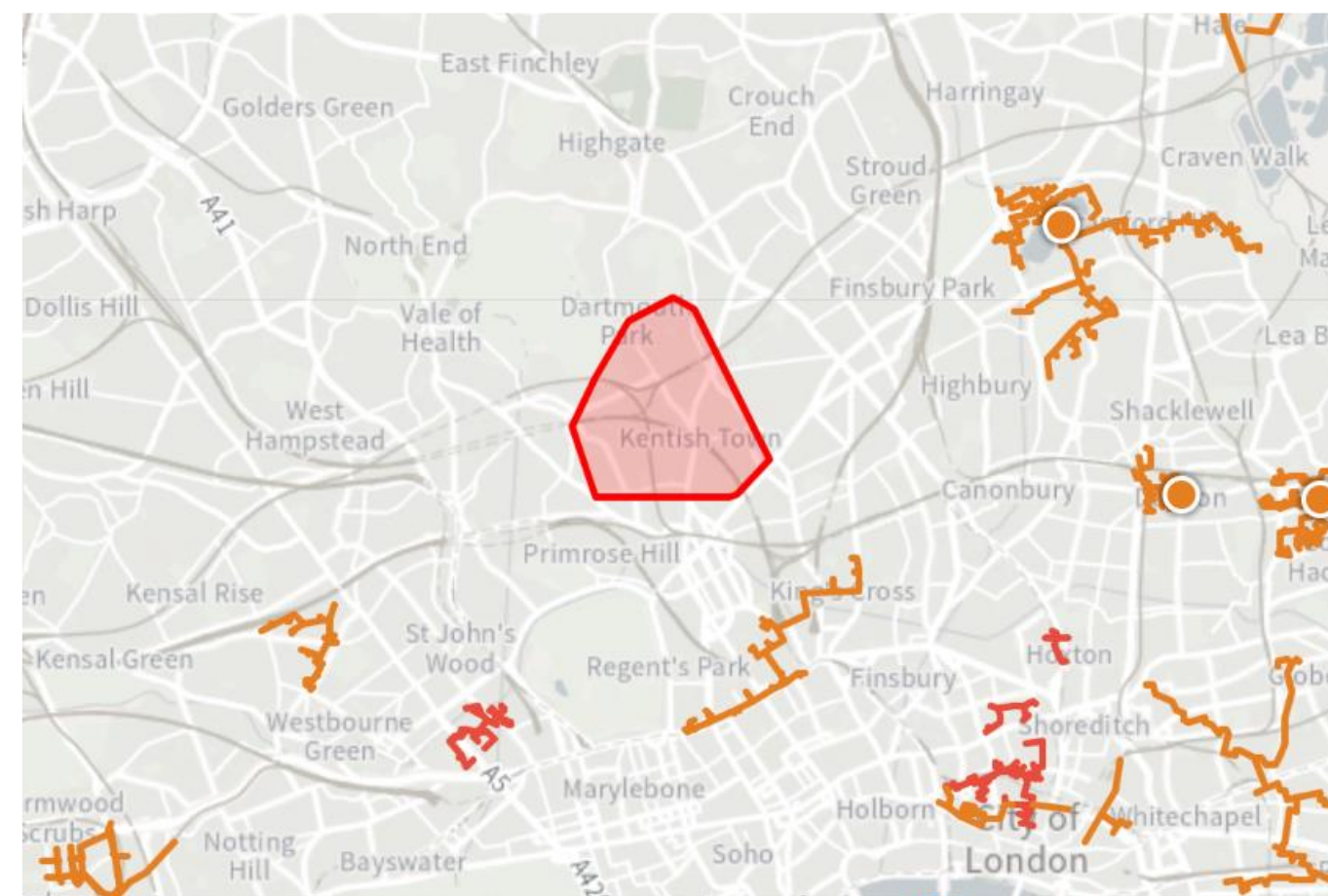


Figure 3: London Heat Map showing existing heat networks (Postcode area NW5, red; Existing heat networks, orange)

RENEWABLE ENERGY (BE GREEN)

For the last step of the Energy Hierarchy, opportunities for producing, storing, and using renewable energy on-site are investigated and maximised to the extent feasible.

The capacity for renewable technologies at the site has been explored with the wider design team. The following technologies were considered:

- Biomass boilers
- Air Source Heat Pump (ASHP)
- Ground Source Heat Pump (GSHP)
- Photovoltaic Solar Panels
- Solar Thermal Hot Water
- Wind Technology

Of the above technologies ASHPs were deemed the most appropriate to supply heat, on the grounds of feasibility, viability and scale of whole life energy and carbon savings. Further details on the specification and operation of the ASHP system is given on the page that follows.

Table 6 sets out the energy systems’ design inputs used for the SAP calculations to establish the scheme’s energy efficiency and carbon performance for this stage.

Table 6: A summary of the SAP inputs for the Be Green stage of the energy hierarchy

Technical Information		
Domestic Be Green Stage		
Space Heating System	Individual Air Source Heat Pumps	175.1% default efficiency, MCS certified
Heating Emitter	Underfloor	-
Domestic Hot Water System	Same as space heating	-
Storage	Yes	~180/240 litres, 80mm foam insulation
Space Cooling System	no	-
Low/Zero Carbon Technologies used	Air Source Heat Pumps	175.1% default efficiency, MCS certified
	Photovoltaic Solar Panels	10.8 kWp

Air Source Heat Pumps (ASHPs)

Where heat pumps are proposed, the system needs to be sized appropriately and specified to achieve a high seasonal coefficient of performance to ensure optimum, low carbon operation and peak demand. This applies to any type of heat pump proposals including air source heat pumps (ASHPs), ground source heat pumps (GSHPs), water source heat pumps (WSHPs) or hybrid and ambient loop types of systems.

Specifically, for ASHPs, it is advised that the heat pump complies with the minimum performance standards as set out in the Enhanced Capital Allowances (ECA) product criteria as well as with other relevant issues as outlined in the Microgeneration Certification Scheme (MCS) Heat Pump Product Certification.

The details of the air source heat pump system will be provided at the detailed design stage; therefore, conservative efficiencies for space heating and hot water have been used for the purpose of this report based on default SAP figures for the residential uses.

Refrigerant pipe-runs will be minimised and in accordance with guidance from the specific supplier. As the scheme is a single dwelling development, individual air source heat pumps will be specified combined with a fully insulated hot water cylinder. The hot water storage introduces an element of demand-side flexibility, which, combined with smart controls, will further optimise the scheme’s energy and carbon performance, and positively contribute to grid decarbonisation.

The location of the outdoor condenser will be on the roof of the development out of site from any noise-sensitive neighbouring properties

Further detail will be mapped out at the detailed design stage.

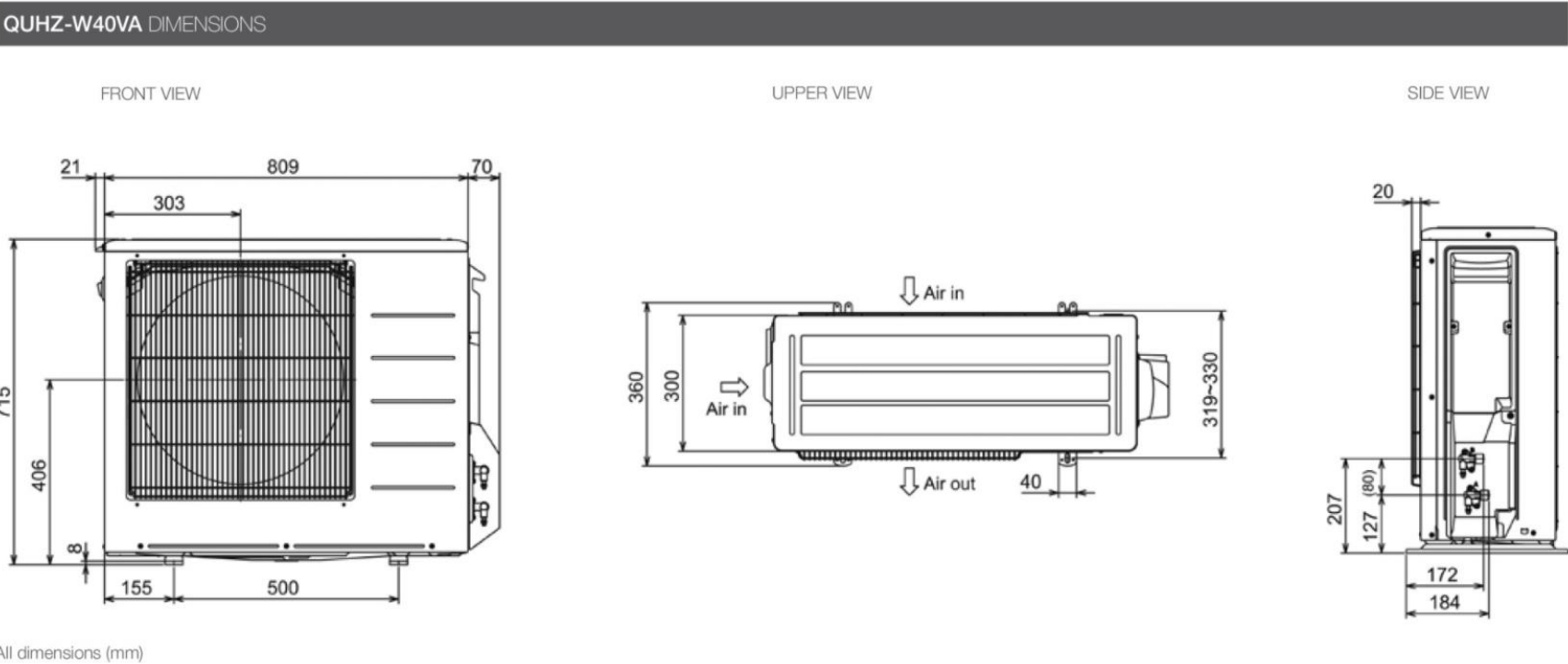


Figure 5: (top-left and top-right) ©Daikin Altherma 3 application in a house and the H Ht outdoor unit model. (Bottom) ©Mitsubishi QUHZ-W40VA example dimensions

Photovoltaic Solar Panels

Photovoltaic solar panels are the preferred on-site renewable generation technology as electricity is off-set on-site and can be utilised either by the tenants themselves or within the landlord areas. The variables used are set out in the table below and location of the array in the adjoining figure.

The scheme will provide space for approximately 10.8 kWp achieving an approximate annual carbon saving of 1.8tCO₂ per year.

Table 7: Photovoltaic solar panel parameter assumptions

PV Item	Description	Unit
Approx. PV array size	63	m ²
Assumed panel power	300	Watt panel
Length of panel	1.6	m
Width of panel	1.1	m
Total panel size	1.76	m ²
Inclination of panel	Horizontal	
Total peak power	10.8	kWp
Assumed # of panels	36	# panels
Total CO ₂ savings	1800	kgCO ₂



Figure 6: Indicative space for photovoltaic solar panel array location on the roof of the proposed development (Red)

MONITOR ENERGY (BE SEEN)

To truly achieve net zero-carbon buildings, there needs to be a better understanding of the actual operational energy performance of a development and work towards bridging the ‘performance gap’ between design theory and actual energy use. London Plan Policy SI 2 sets out the ‘be seen’ requirement for all major development proposals to monitor and report on their actual operational energy performance.

The applicant complies with the requirement to provide accurate and verified estimates of each of the performance indicators of each reporting stage through the appropriate ‘be seen’ reporting template. To comply with Policy SI 1, this scheme will provide accurate and verified estimates of each of the performance indicators at the relevant reporting stage through the appropriate ‘be seen’ reporting templates.

This scheme will provide estimates of each of the performance indicators for the planning stage (RIBA Stage 2/3), as illustrated to the right, and then the as-built stage and in-use stage, as required. At the planning stage, the webform will be submitted at the same time as the energy assessment and all other planning application documents.

Performance Indicator Group	Requirements at Planning Stage
Contextual	- Location Unique Property Reference Number (UPRN) or Address - Site plan - Typology/use - GIA for each typology/use - Anticipated target dates for each ‘be seen’ reporting stage
Building Energy Use	- Grid electricity consumption (kWh) - Gas consumption (kWh) - Other fuels consumption (kWh) - District heating/ cooling consumption (if applicable) (kWh)
Renewable Energy Use	Energy generation (kWh)
Energy Storage	N/A
Plant Parameters	N/A
Carbon	- Carbon emissions estimates (tonnes CO2/m2) for residential, non-residential and whole development - Carbon shortfall for the entire development (tonnes CO2) - Estimated carbon offset amount (£)

CARBON EMISSION RESULTS SUMMARY

Following the energy hierarchy process, the applicant has opted for passive design features, a highly efficient fabric and individual air source heat pump solution for space heating and domestic hot water; the scheme will be naturally ventilated with intermittent mechanical extract fans.

Based on the SAP energy modelling, the regulated carbon emissions of the scheme are 57% lower than the baseline scheme. The proposed energy strategy therefore delivers a highly efficient, low carbon dwelling that substantially exceeds the on-site carbon reduction target of 35% stipulated by the Local Plan.

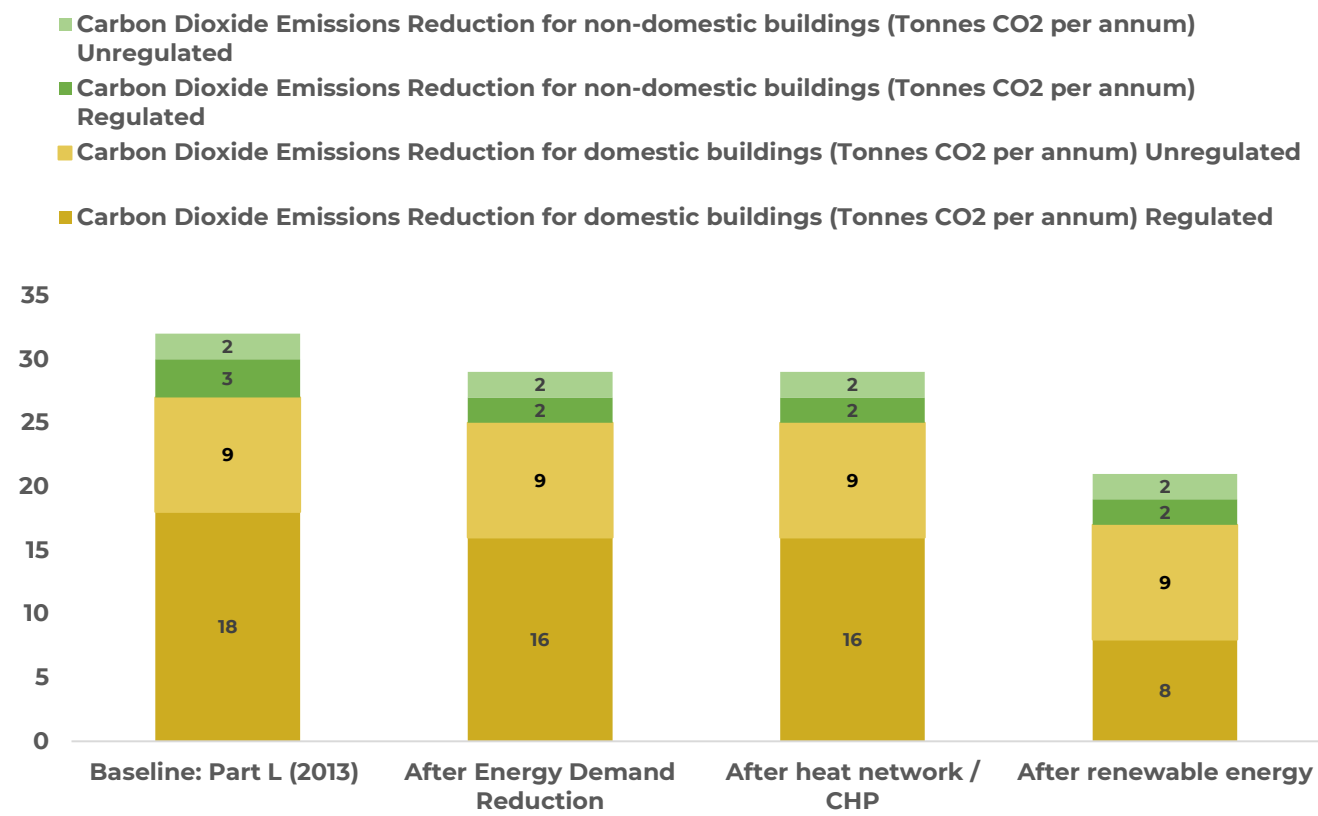


Figure 7: Total on-site savings at each stage of the energy hierarchy

Table 8: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for domestic buildings (SAP 10)

Energy Hierarchy stage	Carbon Dioxide Emissions for domestic buildings (tonnes CO ₂ per annum)		Carbon Dioxide Emissions for non-domestic buildings (tonnes CO ₂ per annum)	
	Regulated	Unregulated	Unregulated	Regulated
Baseline: Part L 2013	18	9	3	2
After energy demand reduction	16	9	2	2
After heat network / CHP	16	9	2	2
After renewable energy	8	9	2	2

Table 9: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for domestic buildings (SAP 10)

Energy Hierarchy stage	Regulated domestic carbon dioxide savings		Regulated non-domestic carbon dioxide savings	
	(tonnes CO ₂ per annum)	(%)	(tonnes CO ₂ per annum)	(%)
Savings from energy demand reduction	2	16%	1	30%
Savings from heat network / CHP	0	0	0	0%
Savings from renewable energy	4	41%	0	12%
Cumulative on-site savings	5	57%	1	42%

Table 10: Technical Input details for the On-Site CO2 calculations

Item	Comment		
General			
Description	4-storey development consisting of a commercial unit on the ground floor and residential units spread across the ground and upper floors.		
Calculation method	Elmhurst 2012 & Approved Document Part L1A		
Technical Information			
Building Fabric	Input	Unit	Comment
External Wall U-value	0.14	W/m²K	Including wall to unheated corridor spaces
Roof U-value	0.12	W/m²K	Including roof to terraces
Ground Floor U-value	0.12	W/m²K	-
Windows U-value	1.2	W/m²K	Not including frame
Windows g-value	0.63	-	-
Window Frame-Factor	0.7	-	-
Thermal Mass Parameter	Medium	TMP	Default value
Thermal Bridging Y-value	<0.1	-	Thermal Bridging calculations TBD
Ventilation Method	Nuaire MRXBOXAB-ECO3	-	Mechanical Ventilation with Heat Recovery, Approved Inspector
System Assumptions			All wet rooms including kitchen
Air permeability	3.0	@50Pa (m.h3/m2)	A low air permeability required to improve mech vent efficiency
Be Lean Stage			
Space Heating System	Gas Boiler		89.5% efficiency
Heating Emitter	Radiators		-
Domestic Hot Water System	Same as space heating		-
Storage	no		-
Space Cooling System	no		-
Be Clean Stage			
Space Heating System	Gas Boiler		89.5% efficiency
Heating Emitter	Radiators		-
Domestic Hot Water System	Same as space heating		-
Storage	no		-
Space Cooling System	no		-
Be Green Stage			
Space Heating System	Air Source Heat Pumps		175.1% default efficiency, MCS certified
Heating Emitter	Underfloor		-
Domestic Hot Water System	Same as space heating		-
Storage	Yes		~180/240 litres, 80mm foam insulation
Space Cooling System	no		-
Low/Zero Carbon Technologies used	Air Source Heat Pumps		175.1% default efficiency, MCS certified 10.8kWp solar panels
	Photovoltaic Solar Panels		

Table 11: Area weighted Fabric Energy Efficiency ratings for the domestic portion of the development

	TFEE (kWh/m²)	DFEE (kWh/m²)	Improvement (%)
Development total	52.47	46.62	11%

SUSTAINABILITY AND CLIMATE CHANGE APPRAISAL

To meet the Local Authority’s sustainability requirements, we have set out the sustainability credentials of the scheme in similar format to that of the, now defunct, Code for Sustainable Homes.

In a statement made on 25 March 2015, the Secretary of State for Communities and Local Government, Eric Pickles, confirmed that from 27 March 2015, changes to the 2008 Climate Change Act would mean local authorities in England could no longer require code level 3, 4, 5 or 6 as part of the conditions imposed on planning permissions. Applicants should work towards to the relevant Building Regulations standard; however, energy requirements for dwellings in the UK are now typically set by the Building Regulations equivalent to code level 4.

For the purpose of this assessment, we have used the Code in combination with the Sustainability Checklist categories as a method for assessing and demonstrating the residential part of the scheme’s sustainability credentials and summarised the scheme’s aspirations against each category.



Energy Display Devices

The scheme will be provided with the ability to display energy consumption data and record energy use; this is to promote the specification of equipment to display energy consumption data, thus empowering dwelling occupants to reduce energy use.



Drying Space

To promote a reduced energy means of drying clothes. Space will be made available for the ability to dry clothes to avoid utilising heat energy.



Energy Labelled White Goods

Where white goods will be provided these will be classified as energy efficient with at least an A-rating, where feasible; this is to promote the provision or purchase of energy efficient white goods, thus reducing the CO₂ emissions from appliance use in the dwelling.



External Lighting

All external space lighting, including lighting in common areas, will be provided by dedicated energy efficient fittings with appropriate control systems in-line with Building Regulations standards; this is to promote the provision of energy efficient external lighting, thus reducing CO₂ emissions associated with the dwelling.



Cycle Storage

Bike storage will be provided on the ground floor; this is to promote the wider use of bicycles as transport by providing adequate and secure cycle storage facilities, thus reducing the need for short car journeys and the associated CO₂ emissions.



Sustainable Transport

This scheme is car free.



Home Office

The scheme should promote working from home by providing occupants with the necessary space and services thus reducing the need to commute.

Water



Indoor Water Use

The water consumption criteria for the dwellings will be in line with the 110 l/p/day in compliance with local policy.

To reduce the consumption of potable water in the home from all sources, including borehole well water, using water efficient fittings, appliances, and water recycling systems.



External Water Use

Space should be made available for the provision of water butts in private amenity spaces; this is to promote the recycling of rainwater and reduce the number of mains potable water used for external water uses.

Materials



Environmental Impact of Materials

To specify materials with lower environmental impacts over their life cycle; where feasible, key elements of the building Envelope will achieve an equivalent rating of A+ to D in the 2008 version of The Green Guide:

- Roof
- External walls
- Internal walls (including separating walls)
- Upper and ground floors (including separating floors)
- Windows.



Responsible Sourcing of Materials - Basic Building Elements

To promote the specification of responsibly sourced materials for the basic building elements; materials in the following Building Elements will be responsibly sourced:

- a) Frame
- b) Ground floor
- c) Upper floors (including separating floors)
- d) Roof
- e) External walls
- f) Internal walls (including separating walls)
- g) Foundation/substructure (excluding sub-base materials)
- h) Staircase

Additionally, timber in these elements will be legally sourced



Responsible Sourcing of Materials - Finishing Elements

To promote the specification of responsibly sourced materials for the finishing elements; materials in the following Finishing Elements will be responsibly sourced:

- a) Staircase
- b) Windows
- c) External & internal doors
- d) Skirting
- e) Panelling
- f) Furniture
- g) Fascias
- h) Any other significant use

Additionally, timber in these elements will be legally sourced

Surface Water Run-Off



Management of Surface Water Run-off from Developments

To design surface water drainage for housing developments which avoid, reduce and delay the discharge of rainfall run-off to watercourses and public sewers the scheme will use SuDS techniques; this will protect receiving waters from pollution and minimise the risk of flooding and other environmental damage in watercourses.



Flood Risk

There are no known watercourses within or adjacent to the site. The site is located within Flood Zone 1 on the EA flood map, which indicates a ‘low’ risk of flooding from fluvial and tidal sources. ‘Low’ risk areas have an annual probability of flooding of less than 0.1% (or 1 in 1000 years).

Waste



Storage of Non-recyclable Waste and Recyclable Household Waste

To provide adequate internal and external storage space for non-recyclable waste and recyclable household waste, a recycling scheme operator will be appointed based on the local authority’s requirements to maintain bins and collect recyclable waste regularly. Space for recycling containers will:

- be located in an adequate external space
- be sized according to the frequency of collection, based on guidance from the
- recycling scheme operator
- store recyclable waste in identifiably different bins



Construction Site Waste Management

A compliant Site Waste Management Plan (SWMP) will be carried out setting out target benchmarks for waste, procedures for minimising hazardous waste and monitoring/measuring/reporting of hazardous and non-hazardous waste groups; this is to promote resource efficiency via the effective and appropriate management of construction site waste.

The Site Waste Management Plan (SWMP) will include procedures to sort and divert waste from landfill, through either.

- a. Re-use on site (in situ or for new applications)
- b. Re-use on other sites
- c. Salvage/reclaim for re-use
- d. Return to the supplier via a ‘take-back’ scheme
- e. Recovery and recycling using an approved waste management contractor
- f. Compost

according to the defined waste groups (in line with the waste streams generated by the scope of the works).



Composting

Space for individual home composting facilities will be provided to promote the provision of compost facilities to reduce the amount of household waste sent to landfill.

Pollution



Global Warming Potential (GWP) of Insulants

To promote the reduction of emissions of gases with high GWP associated with the manufacture, installation, use and disposal of foamed thermal and acoustic insulating materials; where feasible, insulating materials in the elements of the dwelling listed below will have a low GWP (in manufacture AND installation):

- Roofs: including loft access
- Walls: internal and external including lintels and all acoustic insulation
- Floors: including ground and upper floors
- Hot water cylinder: pipe insulation and other thermal stores
- Cold water storage tanks: where provided
- External doors



NOx Emissions

To promote the reduction of nitrogen oxide (NOX) emissions into the atmosphere; there will be no combustion boilers provided on-site within the dwellings.

Health & Well-being



Daylighting

Living/kitchen spaces will look to meet at least a 1.5% Average Daylight Factor (ADF) and bedrooms meet at least a 1% ADF, where feasible; this is to promote good daylighting and thereby improve quality of life and reduce the need for energy to light the home.



Sound Insulation

Building materials will be chosen as such to improve the sound insulation between dwellings and to the main road; in-line with BS8223; this is to promote the provision of improved sound insulation to reduce the likelihood of noise complaints from neighbours.



Private Space

To improve quality of life by promoting the provision of an inclusive outdoor space which is at least partially private outdoor space (private or semi-private) has been provided that is:

- Of a minimum size that allows all occupants to use the space.
- Provided with inclusive access and usability.
- Accessible only to occupants of designated dwellings.

Management



Home User Guide

A Home User Guide will be provided to the owner prior to handover to promote the provision of guidance enabling occupants to understand and operate their home efficiently and make the best use of local facilities.



Considers Constructors Scheme

There is a commitment to meet best practice under a nationally or locally recognised certification scheme such as the Considerate Constructors Scheme; this is to promote the environmentally and socially considerate, and accountable management of construction sites.



Construction Site Impacts

To promote construction sites managed in a manner that mitigates environmental impacts; where feasible, there will be procedures that will typically cover one or more of the following items:

- Monitor, report and set targets for CO₂ production or energy use arising from site activities
- Monitor and report CO₂ or energy use arising from commercial transport to and from site
- Monitor, report and set targets for water consumption from site activities
- Adopt best practice policies in respect of air (dust) pollution arising from site activities
- Adopt best practice policies in respect of water (ground and surface) pollution occurring on the site

Where feasible, 80% of site timber is reclaimed, re-used or responsibly sourced



Security

The principles of Secure by Design will be carried out for the scheme, to promote the design of developments where people feel safe and secure- where crime and disorder, or the fear of crime, does not undermine quality of life or community cohesion.



Ecology

To minimise reductions and promote an improvement in ecological value and enhance the ecological value of the site, the scheme will look to promote:

- development on land that already has a limited value to wildlife, and discourage the development of ecologically valuable sites.
- the protection of existing ecological features from substantial damage during the clearing of the site and the completion of construction works.
- the most efficient use of a building's footprint by ensuring that land and material use is optimised across the development.

CONCLUSION

An assessment of the site’s sustainability and energy credentials has been carried out for 160 Malden Road, London, NW5 4BS.

The proposal is to demolish the existing buildings on site and to deliver a 4-storey development consisting of a commercial unit on the ground floor and 15 residential units spread across the ground and upper floors.

The energy strategy follows the energy hierarchy; Use Less Energy (Be Lean), Supply energy efficiently (Be Clean) and use Renewable and low carbon energy (Be Green) as per Policy CCl of the Camden Local Plan (2017).

The scheme adopts a fabric-first and passive design approach to reduce energy demand for space heating and eliminate the need for active cooling. Key design elements of the proposals comprise of:

- Window reveals, balconies, and internal blinds, where feasible
- A well-insulated building fabric shell
- Being airtight, reducing draughts and heat-loss.
- Mechanical ventilation with heat recovery (MVHR)

An all-electric, air source heat-pump system is proposed to deliver the space heating and hot water demand for this scheme. ASHPs offer a highly energy efficient low carbon solution, that future-proofs the dwelling towards achieving net zero carbon in operation in coming years. Low operational costs and carbon emissions, are complemented with improved air quality due to zero combustion on-site, benefitting the health & wellbeing of occupants.

Based on the assessment undertaken, the energy strategy set out within this report delivers the following:

- Domestic regulated CO₂ savings of 10 tonnes per annum and a CO₂ reduction of 57% compared to the baseline
- Non-domestic regulated CO₂ savings of 1 tonne per annum and a CO₂ reduction of 42% compared to the baseline
- **On-site cumulative regulated CO₂ savings of 12 tonnes and a CO₂ reduction of 57% compared to the baseline**

The site-wide results summary for the carbon emissions are set out to the right. Further detail may be found in the body of the report.

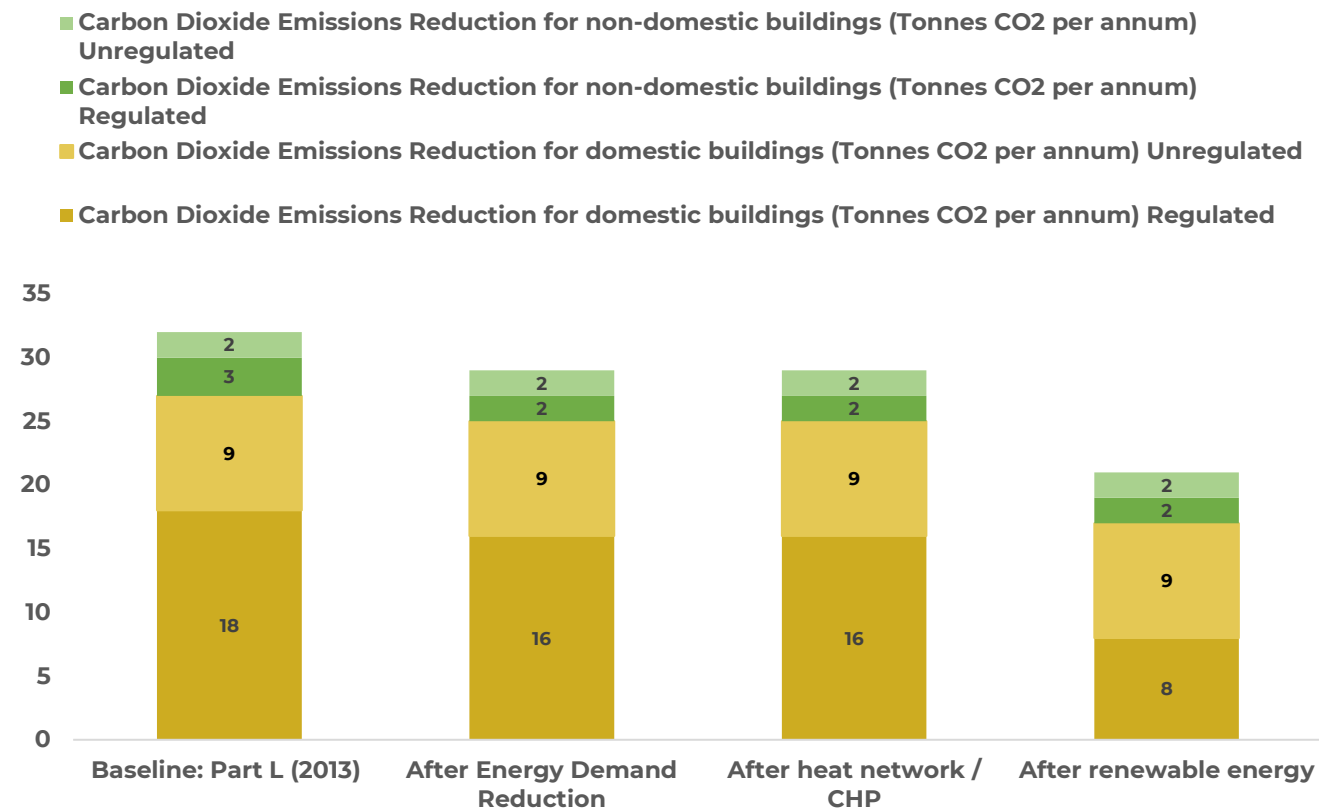


Figure 8: Total site-wide savings at each stage of the energy hierarchy

Table 12: Total site-wide savings at each stage of the energy hierarchy

	Regulated domestic carbon dioxide savings		Regulated non-domestic carbon dioxide savings	
	(Tonnes CO ₂ per annum)	(%)	(Tonnes CO ₂ per annum)	(%)
Savings from energy demand reduction	3	14%	1	30%
Savings from heat network / CHP	0	0%	0	0%
Savings from renewable energy	8	35%	0	12%
Cumulative on-site savings	10	57%	1	42%

Emissions within this report are based on the following CO₂ emission rates:

- Natural Gas 0.210 kgCO₂/kWh
- Grid electricity 0.233 kgCO₂/kWh

These represent the SAP 10 carbon factor figures. For the assessment of demand reduction measures (Be Lean stage) space heating and domestic hot water is assumed to be from gas boilers at this stage with an 89.5% efficient gas boiler, to standardize a benchmark target. However, the Be Green stage of the energy hierarchy results considers air-source heat pumps as an alternative method for space heating and hot water

APPENDIX A– DER/TER WORKSHEETS

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 1			Issued on Date	13/04/2022
Assessment Reference	Unit 1_Be Green	Prop Type Ref	160 Malden Road		
Property	160, Malden Road				
SAP Rating	81 B	DER	21.91	TER	31.64
Environmental	83 B	% DER<TER	30.75		
CO ₂ Emissions (t/year)	1.54	DFEE	64.78	TFEE	67.83
General Requirements Compliance	Pass	% DFEE<TFEE	4.50		
Assessor Details	Mr. Andy Love, Love Design Studio Ltd, Tel: 07563755762, Mail@lovedesignstudio.co.uk			Assessor ID	U860-0001
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 91 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

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 31.64 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 21.91 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)67.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)64.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.13 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.22 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.100

3 Air permeability

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

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric

Air-to-water heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 1.82 kWh/day	
Permitted by DBSCG 2.10	OK	
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK

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:	0.60	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley):	Not significant	OK
Based on:		
Overshading:	Average	
Air change rate:	2.00 ach	
Blinds/curtains:		

10 Key features

External wall U-value	0.14 W/m ² K
External wall U-value	0.14 W/m ² K
External wall U-value	0.14 W/m ² K
External wall U-value	0.14 W/m ² K
Party wall U-value	0.00 W/m ² K
Roof U-value	0.12 W/m ² K
Floor U-value	0.12 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	0.68 kW

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	90.8100 (1b)	x 2.7000 (2b)	= 245.1870 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.8100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	245.1870 (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) =												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
Half glazed doors			20.6400	1.2000	24.7680		(26a)
Solid Door			2.0500	1.4000	2.8700		(26)
Heat Loss Floor 1			90.8100	0.1200	10.8972		(28a)
External Wall 1	48.2700	22.6900	25.5800	0.1400	3.5812		(29a)
Stairs	13.8700		13.8700	0.1243	1.7245		(29a)
Bike store	14.2200		14.2200	0.1243	1.7680		(29a)
Corridor	15.0700		15.0700	0.1321	1.9900		(29a)
External Roof 1	24.0600		24.0600	0.1200	2.8872		(30)
Total net area of external elements Aum(A, m ²)			206.3000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.4861		(33)
Party Wall 1			30.4600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (User defined value 0.100 * total exposed area)							20.6300 (36)
Total fabric heat loss						(33) + (36) =	71.1161 (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	23.0042	22.7463	22.4884	21.1989	20.9410	19.6514	19.6514	19.3935	20.1672	20.9410	21.4568	21.9726 (38)
Heat transfer coeff	94.1204	93.8624	93.6045	92.3150	92.0571	90.7676	90.7676	90.5097	91.2834	92.0571	92.5729	93.0887 (39)
Average = Sum(39)m / 12 =												92.2505 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0365	1.0336	1.0308	1.0166	1.0137	0.9995	0.9995	0.9967	1.0052	1.0137	1.0194	1.0251 (40)
HLP (average)												1.0159 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6366 (42)
Average daily hot water use (litres/day)												96.8203 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	106.5024	102.6296	98.7567	94.8839	91.0111	87.1383	87.1383	91.0111	94.8839	98.7567	102.6296	106.5024 (44)
Energy conte	157.9399	138.1353	142.5432	124.2726	119.2426	102.8973	95.3494	109.4149	110.7216	129.0354	140.8522	152.9564 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy content (annual)												Total = Sum (45)m =	1523.3609 (45)
Distribution loss (46)m = 0.15 x (45)m													
	23.6910	20.7203	21.3815	18.6409	17.8864	15.4346	14.3024	16.4122	16.6082	19.3553	21.1278	22.9435	(46)
Water storage loss:													
Store volume												180.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0115	(51)
Volume factor from Table 2a												0.8736	(52)
Temperature factor from Table 2b												0.5400	(53)
Enter (49) or (54) in (55)												0.9805	(55)
Total storage loss	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965	(56)
If cylinder contains dedicated solar storage	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965	(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	211.5988	186.6014	196.2021	176.2006	172.9014	154.8252	149.0083	163.0738	162.6496	182.6943	192.7802	206.6153	(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	211.5988	186.6014	196.2021	176.2006	172.9014	154.8252	149.0083	163.0738	162.6496	182.6943	192.7802	206.6153	(64)
Heat gains from water heating, kWh/month	95.4421	84.7029	90.3227	82.8630	82.5753	75.7557	74.6308	79.3076	78.3573	85.8314	88.3757	93.7851	(65)
Total per year (kWh/year) = Sum (64)m =												2155.1510	(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	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	32.0128	28.4335	23.1236	17.5061	13.0860	11.0478	11.9375	15.5168	20.8266	26.4442	30.8643	32.9025	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	240.5601	243.0563	236.7658	223.3741	206.4695	190.5815	179.9673	177.4711	183.7616	197.1533	214.0579	229.9459	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	(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)	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	(71)
Water heating gains (Table 5)	128.2824	126.0459	121.4015	115.0875	110.9883	105.2163	100.3102	106.5962	108.8296	115.3648	122.7441	126.0553	(72)
Total internal gains	466.4050	463.0854	446.8407	421.5174	396.0934	372.3952	357.7647	365.1337	378.9675	404.5119	433.2159	454.4534	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
Solar gains	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (83)
Total gains	466.4050	463.0854	446.8407	421.5174	396.0934	372.3952 357.7647 365.1337 378.9675 404.5119 433.2159 454.4534 (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	67.0020	67.1861	67.3712	68.3123	68.5037	69.4769	69.4769	69.6749	69.0843	68.5037	68.1220	67.7445	
alpha	5.4668	5.4791	5.4914	5.5542	5.5669	5.6318	5.6318	5.6450	5.6056	5.5669	5.5415	5.5163	
util living area	0.9991	0.9989	0.9985	0.9972	0.9926	0.9690	0.8917	0.8992	0.9761	0.9952	0.9984	0.9992	(86)
MIT	19.8322	19.8921	20.0368	20.2616	20.5090	20.7660	20.9146	20.9064	20.7239	20.4116	20.0950	19.8255	(87)
Th 2	20.0531	20.0554	20.0578	20.0695	20.0719	20.0837	20.0837	20.0861	20.0790	20.0719	20.0672	20.0625	(88)
util rest of house	0.9988	0.9986	0.9979	0.9959	0.9879	0.9425	0.7922	0.8087	0.9565	0.9925	0.9977	0.9990	(89)
MIT 2	18.4803	18.5696	18.7832	19.1205	19.4826	19.8551	20.0327	20.0263	19.7938	19.3411	18.8753	18.4774	(90)
Living area fraction	19.0150	19.0927	19.2791	19.5718	19.8886	20.2154	20.3815	20.3744	20.1617	19.7645	19.3577	19.0106	(91)
MIT	19.0150	19.0927	19.2791	19.5718	19.8886	20.2154	20.3815	20.3744	20.1617	19.7645	19.3577	19.0106	(92)
Temperature adjustment	19.0150	19.0927	19.2791	19.5718	19.8886	20.2154	20.3815	20.3744	20.1617	19.7645	19.3577	19.0106	(93)
adjusted MIT	19.0150	19.0927	19.2791	19.5718	19.8886	20.2154	20.3815	20.3744	20.1617	19.7645	19.3577	19.0106	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	465.5982	462.1600	445.5835	419.3487	390.7883	352.8261	297.3251	307.8437	363.3798	400.9662	431.9239	453.7844	(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	1384.9831	1332.1617	1196.1794	985.1696	753.8182	509.6986	343.2385	359.7244	553.3341	843.6615	1134.7342	1378.7040	(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	684.0224	584.6411	558.4433	407.3910	270.0942	0.0000	0.0000	0.0000	0.0000	329.3653	506.0234	688.1401	(98)
Space heating												4028.1209	(98)
Space heating per m ²												44.3577	(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

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 %)													175.1000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2300.4688 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	684.0224	584.6411	558.4433	407.3910	270.0942	0.0000	0.0000	0.0000	0.0000	329.3653	506.0234	688.1401	(98)
Space heating efficiency (main heating system 1)	175.1000	175.1000	175.1000	175.1000	175.1000	0.0000	0.0000	0.0000	0.0000	175.1000	175.1000	175.1000	(210)
Space heating fuel (main heating system)	390.6467	333.8898	318.9282	232.6619	154.2514	0.0000	0.0000	0.0000	0.0000	188.1013	288.9911	392.9984	(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	211.5988	186.6014	196.2021	176.2006	172.9014	154.8252	149.0083	163.0738	162.6496	182.6943	192.7802	206.6153	(64)
Efficiency of water heater	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)
Fuel for water heating, kWh/month	120.8446	106.5685	112.0515	100.6286	98.7444	88.4210	85.0990	93.1318	92.8895	104.3371	110.0972	117.9984	(219)
Water heating fuel used												1230.8115	(219)
Annual totals kWh/year													
Space heating fuel - main system												2300.4688	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)													224.3461 (230a)
central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													254.3461 (231)
Electricity for lighting (calculated in Appendix L)													565.3557 (232)
Energy saving/generation technologies (Appendices M, N and Q)													
PV Unit 0 (0.80 * 0.68 * 951 * 1.00) =										-517.1351			-517.1351 (233)
Total delivered energy for all uses													3833.8470 (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	2300.4688	0.5190	1193.9433 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1230.8115	0.5190	638.7912 (264)
Space and water heating			1832.7345 (265)
Pumps and fans	254.3461	0.5190	132.0056 (267)
Energy for lighting	565.3557	0.5190	293.4196 (268)
Energy saving/generation technologies			
PV Unit	-517.1351	0.5190	-268.3931 (269)
Total CO2, kg/year			1989.7666 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			21.9100 (273)

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

DER		21.9100 ZC1
Total Floor Area	TFA	90.8100
Assumed number of occupants	N	2.6366
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		15.6977 ZC2
CO2 emissions from cooking, equation (L16)		2.0073 ZC3
Total CO2 emissions		39.6150 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		39.6150 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	90.8100 (1b)	x 2.7000 (2b)	= 245.1870 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.8100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 245.1870 (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) = 0.1224 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3724 (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) =				0.3165 (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	0.4035	0.3956	0.3877	0.3482	0.3402	0.3007	0.3007	0.2928	0.3165	0.3402	0.3561	0.3719 (22b)
Effective ac	0.5814	0.5783	0.5752	0.5606	0.5579	0.5452	0.5452	0.5429	0.5501	0.5579	0.5634	0.5692 (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			2.0500	1.0000	2.0500		(26)
TER Semi-glazed door			20.6400	1.2000	24.7680		(26a)
Heat Loss Floor 1			90.8100	0.1300	11.8053		(28a)
External Wall 1	48.2700	22.6900	25.5800	0.1800	4.6044		(29a)
Stairs	13.8700		13.8700	0.1800	2.4966		(29a)
Bike store	14.2200		14.2200	0.1800	2.5596		(29a)
Corridor	15.0700		15.0700	0.1800	2.7126		(29a)
External Roof 1	24.0600		24.0600	0.1300	3.1278		(30)
Total net area of external elements Aum(A, m ²)			206.3000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	54.1243		(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)							5.5133 (36)
Total fabric heat loss						(33) + (36) =	59.6376 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	47.0439	46.7881	46.5373	45.3595	45.1392	44.1133	44.1133	43.9234	44.5085	45.1392	45.5849	46.0510 (38)
Heat transfer coeff	106.6815	106.4257	106.1749	104.9971	104.7768	103.7509	103.7509	103.5610	104.1461	104.7768	105.2225	105.6886 (39)
Average = Sum(39)m / 12 =												104.9961 (39)
HLP	1.1748	1.1720	1.1692	1.1562	1.1538	1.1425	1.1425	1.1404	1.1469	1.1538	1.1587	1.1638 (40)
HLP (average)												1.1562 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6366 (42)
Average daily hot water use (litres/day)												96.8203 (43)
Daily hot water use	106.5024	102.6296	98.7567	94.8839	91.0111	87.1383	87.1383	91.0111	94.8839	98.7567	102.6296	106.5024 (44)
Energy conte	157.9399	138.1353	142.5432	124.2726	119.2426	102.8973	95.3494	109.4149	110.7216	129.0354	140.8522	152.9564 (45)
Energy content (annual)										Total = Sum(45)m =		1523.3609 (45)
Distribution loss (46)m = 0.15 x (45)m	23.6910	20.7203	21.3815	18.6409	17.8864	15.4346	14.3024	16.4122	16.6082	19.3553	21.1278	22.9435 (46)
Water storage loss:												
Store volume												180.0000 (47)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

a) If manufacturer declared loss factor is known (kWh/day):	1.5520 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.8381 (55)
Total storage loss	
25.9803 23.4661 25.9803 25.1422 25.9803 25.1422 25.9803 25.9803 25.1422 25.9803 25.1422 25.9803 (56)	
If cylinder contains dedicated solar storage	
25.9803 23.4661 25.9803 25.1422 25.9803 25.1422 25.9803 25.9803 25.1422 25.9803 25.1422 25.9803 (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	
207.1826 182.6125 191.7859 171.9268 168.4852 150.5515 144.5921 158.6576 158.3758 178.2781 188.5064 202.1991 (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	
207.1826 182.6125 191.7859 171.9268 168.4852 150.5515 144.5921 158.6576 158.3758 178.2781 188.5064 202.1991 (64)	
Heat gains from water heating, kWh/month	
91.9092 81.5118 86.7898 79.4440 79.0423 72.3367 71.0978 75.7746 74.9383 82.2984 84.9567 90.2521 (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	
131.8323 131.8323 131.8323 131.8323 131.8323 131.8323 131.8323 131.8323 131.8323 131.8323 131.8323 131.8323 (66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
32.0128 28.4335 23.1236 17.5061 13.0860 11.0478 11.9375 15.5168 20.8266 26.4442 30.8643 32.9025 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
240.5601 243.0563 236.7658 223.3741 206.4695 190.5815 179.9673 177.4711 183.7616 197.1533 214.0579 229.9459 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
36.1832 36.1832 36.1832 36.1832 36.1832 36.1832 36.1832 36.1832 36.1832 36.1832 36.1832 36.1832 (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)	
-105.4658 -105.4658 -105.4658 -105.4658 -105.4658 -105.4658 -105.4658 -105.4658 -105.4658 -105.4658 -105.4658 -105.4658 (71)	
Water heating gains (Table 5)	
123.5338 121.2973 116.6529 110.3389 106.2396 100.4676 95.5616 101.8476 104.0810 110.6161 117.9954 121.3066 (72)	
Total internal gains	
461.6563 458.3368 442.0921 416.7688 391.3448 367.6466 353.0161 360.3851 374.2188 399.7633 428.4673 449.7047 (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
Solar gains	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (83)
Total gains	461.6563	458.3368	442.0921	416.7688	391.3448	367.6466 353.0161 360.3851 374.2188 399.7633 428.4673 449.7047 (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 59.1129 59.2550 59.3949 60.0612 60.1875 60.7826 60.7826 60.8941 60.5520 60.1875 59.9325 59.6682	
alpha 4.9409 4.9503 4.9597 5.0041 5.0125 5.0522 5.0522 5.0596 5.0368 5.0125 4.9955 4.9779	
util living area	
0.9991 0.9989 0.9985 0.9975 0.9938 0.9768 0.9216 0.9273 0.9817 0.9958 0.9985 0.9992 (86)	
MIT 19.6406 19.7066 19.8683 20.1170 20.3949 20.6843 20.8642 20.8527 20.6366 20.2853 19.9315 19.6319 (87)	
Th 2 19.9402 19.9425 19.9447 19.9552 19.9571 19.9663 19.9663 19.9680 19.9627 19.9571 19.9532 19.9490 (88)	
util rest of house	
0.9987 0.9985 0.9979 0.9962 0.9896 0.9546 0.8303 0.8452 0.9653 0.9934 0.9978 0.9989 (89)	
MIT 2 18.1195 18.2177 18.4559 18.8271 19.2338 19.6541 19.8811 19.8695 19.5848 19.0742 18.5544 18.1128 (90)	
Living area fraction	
MIT 18.7212 18.8066 19.0146 19.3373 19.6931 20.0616 20.2699 20.2584 20.0008 19.5532 19.0991 18.7137 (92)	
Temperature adjustment	
adjusted MIT 18.7212 18.8066 19.0146 19.3373 19.6931 20.0616 20.2699 20.2584 20.0008 19.5532 19.0991 18.7137 (93)	

8. Space heating requirement

Utilisation	Jan 0.9982	Feb 0.9979	Mar 0.9972	Apr 0.9951	May 0.9881	Jun 0.9574	Jul 0.8647	Aug 0.8749	Sep 0.9662	Oct 0.9920	Nov 0.9970	Dec 0.9984 (94)
Useful gains	460.8115	457.3807	440.8329	414.7161	386.6961	351.9915	305.2413	315.3001	361.5541	396.5545	427.1851	448.9969 (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	1538.4709	1480.0225	1328.7354	1095.8884	837.4875	566.6444	380.7605	399.5784	614.5500	938.0911	1262.5769	1533.9313 (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	801.7786	687.2154	660.5995	490.4440	335.3888	0.0000	0.0000	0.0000	0.0000	402.9033	601.4821	807.1912 (98)
Space heating												4787.0028 (98)
Space heating per m2										(98) / (4) =		52.7145 (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													5119.7891 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	801.7786	687.2154	660.5995	490.4440	335.3888	0.0000	0.0000	0.0000	0.0000	402.9033	601.4821	807.1912	(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)	857.5172	734.9897	706.5235	524.5391	358.7046	0.0000	0.0000	0.0000	0.0000	430.9126	643.2963	863.3061	(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	207.1826	182.6125	191.7859	171.9268	168.4852	150.5515	144.5921	158.6576	158.3758	178.2781	188.5064	202.1991	(64)
Efficiency of water heater (217)m	88.0750	88.0222	87.8497	87.4562	86.6165	79.8000	79.8000	79.8000	79.8000	86.9247	87.6942	88.1328	(216)
Fuel for water heating, kWh/month	235.2343	207.4620	218.3115	196.5862	194.5186	188.6610	181.1931	198.8190	198.4660	205.0948	214.9588	229.4255	(219)
Water heating fuel used												2468.7308	(219)
Annual totals kWh/year													
Space heating fuel - main system												5119.7891	(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)												565.3557	(232)
Total delivered energy for all uses												8228.8756	(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	5119.7891	0.2160	1105.8745 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2468.7308	0.2160	533.2458 (264)
Space and water heating			1639.1203 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	565.3557	0.5190	293.4196 (268)
Total CO2, kg/m2/year			1971.4649 (272)
Emissions per m2 for space and water heating			18.0500 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			3.2311 (272b)
Emissions per m2 for pumps and fans			0.4286 (272c)
Target Carbon Dioxide Emission Rate (TER) = (18.0500 * 1.55) + 3.2311 + 0.4286, rounded to 2 d.p.			31.6400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 1			Issued on Date	13/04/2022
Assessment Reference	Unit 1_Be Lean	Prop Type Ref	160 Malden Road		
Property	160, Malden Road				
SAP Rating	81 B	DER	20.90	TER	21.71
Environmental	83 B	% DER<TER	3.73		
CO ₂ Emissions (t/year)	1.55	DFEE	64.78	TFEE	67.83
General Requirements Compliance	Pass	% DFEE<TFEE	4.50		
Assessor Details	Mr. Andy Love, Love Design Studio Ltd, Tel: 07563755762, Mail@lovedesignstudio.co.uk			Assessor ID	9990-1318
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 91 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
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 21.71 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 20.90 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 67.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 64.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.13 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.22 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified ψ -value of 0.100

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
x x

Efficiency: 90%
Minimum: 88% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage Nominal cylinder loss: 1.82 kWh/day
Permitted by DBSCG 2.10 OK
Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK
Independent timer for DHW OK

Boiler interlock Yes OK

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: 0.60
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK

Based on:

Overshading: Average

Air change rate: 2.00 ach

Blinds/curtains:

10 Key features

External wall U-value	0.14 W/m ² K
External wall U-value	0.14 W/m ² K
External wall U-value	0.14 W/m ² K
External wall U-value	0.14 W/m ² K
Party wall U-value	0.00 W/m ² K
Roof U-value	0.12 W/m ² K
Floor U-value	0.12 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	90.8100 (1b)	x 2.7000 (2b)	= 245.1870 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.8100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 245.1870 (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
Half glazed doors			20.6400	1.2000	24.7680		(26a)
Solid Door			2.0500	1.4000	2.8700		(26)
Heat Loss Floor 1			90.8100	0.1200	10.8972		(28a)
External Wall 1	48.2700	22.6900	25.5800	0.1400	3.5812		(29a)
Stairs	13.8700		13.8700	0.1243	1.7245		(29a)
Bike store	14.2200		14.2200	0.1243	1.7680		(29a)
Corridor	15.0700		15.0700	0.1321	1.9900		(29a)
External Roof 1	24.0600		24.0600	0.1200	2.8872		(30)
Total net area of external elements Aum(A, m ²)			206.3000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		50.4861		(33)
Party Wall 1			30.4600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (User defined value 0.100 * total exposed area)							20.6300 (36)
Total fabric heat loss							(33) + (36) = 71.1161 (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	23.0042	22.7463	22.4884	21.1989	20.9410	19.6514	19.6514	19.3935	20.1672	20.9410	21.4568	21.9726 (38)
Heat transfer coeff	94.1204	93.8624	93.6045	92.3150	92.0571	90.7676	90.7676	90.5097	91.2834	92.0571	92.5729	93.0887 (39)
Average = Sum(39)m / 12 =												92.2505 (39)
HLP	1.0365	1.0336	1.0308	1.0166	1.0137	0.9995	0.9995	0.9967	1.0052	1.0137	1.0194	1.0251 (40)
HLP (average)												1.0159 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6366 (42)
Average daily hot water use (litres/day)												96.8203 (43)
Daily hot water use	106.5024	102.6296	98.7567	94.8839	91.0111	87.1383	87.1383	91.0111	94.8839	98.7567	102.6296	106.5024 (44)
Energy conte	157.9399	138.1353	142.5432	124.2726	119.2426	102.8973	95.3494	109.4149	110.7216	129.0354	140.8522	152.9564 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy content (annual)												Total = Sum (45)m =	1523.3609 (45)
Distribution loss (46)m = 0.15 x (45)m													
23.6910	20.7203	21.3815	18.6409	17.8864	15.4346	14.3024	16.4122	16.6082	19.3553	21.1278	22.9435	(46)	
Water storage loss:													
Store volume												180.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0115	(51)
Volume factor from Table 2a												0.8736	(52)
Temperature factor from Table 2b												0.5400	(53)
Enter (49) or (54) in (55)												0.9805	(55)
Total storage loss	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	29.4160	30.3965	29.4160	30.3965	(56)	
If cylinder contains dedicated solar storage	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	29.4160	30.3965	29.4160	30.3965	(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	211.5988	186.6014	196.2021	176.2006	172.9014	154.8252	149.0083	163.0738	162.6496	182.6943	192.7802	206.6153 (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	211.5988	186.6014	196.2021	176.2006	172.9014	154.8252	149.0083	163.0738	162.6496	182.6943	192.7802	206.6153 (64)	
								Total per year (kWh/year) = Sum (64)m =				2155.1510 (64)	
Heat gains from water heating, kWh/month	95.4421	84.7029	90.3227	82.8630	82.5753	75.7557	74.6308	79.3076	78.3573	85.8314	88.3757	93.7851 (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	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	32.0128	28.4335	23.1236	17.5061	13.0860	11.0478	11.9375	15.5168	20.8266	26.4442	30.8643	32.9025	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	240.5601	243.0563	236.7658	223.3741	206.4695	190.5815	179.9673	177.4711	183.7616	197.1533	214.0579	229.9459	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	(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)	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	(71)
Water heating gains (Table 5)	128.2824	126.0459	121.4015	115.0875	110.9883	105.2163	100.3102	106.5962	108.8296	115.3648	122.7441	126.0553	(72)
Total internal gains	466.4050	463.0854	446.8407	421.5174	396.0934	372.3952	357.7647	365.1337	378.9675	404.5119	433.2159	454.4534	(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			

Solar gains	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (83)	
Total gains	466.4050	463.0854	446.8407	421.5174	396.0934	372.3952	357.7647	365.1337	378.9675	404.5119	433.2159	454.4534 (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	67.0020	67.1861	67.3712	68.3123	68.5037	69.4769	69.4769	69.6749	69.0843	68.5037	68.1220	67.7445
alpha	5.4668	5.4791	5.4914	5.5542	5.5669	5.6318	5.6318	5.6450	5.6056	5.5669	5.5415	5.5163
util living area	0.9991	0.9989	0.9985	0.9972	0.9926	0.9690	0.8917	0.8992	0.9761	0.9952	0.9984	0.9992 (86)
MIT	19.8322	19.8921	20.0368	20.2616	20.5090	20.7660	20.9146	20.9064	20.7239	20.4116	20.0950	19.8255 (87)
Th 2	20.0531	20.0554	20.0578	20.0695	20.0719	20.0837	20.0837	20.0861	20.0790	20.0719	20.0672	20.0625 (88)
util rest of house	0.9988	0.9986	0.9979	0.9959	0.9879	0.9425	0.7922	0.8087	0.9565	0.9925	0.9977	0.9990 (89)
MIT 2	18.4803	18.5696	18.7832	19.1205	19.4826	19.8551	20.0327	20.0263	19.7938	19.3411	18.8753	18.4774 (90)
Living area fraction												0.3956 (91)
MIT	19.0150	19.0927	19.2791	19.5718	19.8886	20.2154	20.3815	20.3744	20.1617	19.7645	19.3577	19.0106 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.8650	18.9427	19.1291	19.4218	19.7386	20.0654	20.2315	20.2244	20.0117	19.6145	19.2077	18.8606 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9982	0.9979	0.9970	0.9945	0.9854	0.9417	0.8123	0.8259	0.9545	0.9905	0.9968	0.9985	(94)
Useful gains	465.5561	462.1101	445.5086	419.1955	390.3236	350.6908	290.6299	301.5732	361.7412	400.6810	431.8431	453.7493	(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	1370.8651	1318.0823	1182.1387	971.3223	740.0096	496.0835	329.6234	346.1480	539.6415	829.8530	1120.8482	1364.7407	(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	673.5499	575.2133	548.0528	397.5313	260.1664	0.0000	0.0000	0.0000	0.0000	319.3039	496.0837	677.7775	(98)
Space heating													3947.6789 (98)
Space heating per m2										(98) / (4) =			43.4719 (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

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 %)													89.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4410.8144 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	673.5499	575.2133	548.0528	397.5313	260.1664	0.0000	0.0000	0.0000	0.0000	319.3039	496.0837	677.7775	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	752.5697	642.6965	612.3495	444.1691	290.6887	0.0000	0.0000	0.0000	0.0000	356.7641	554.2835	757.2933	(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	211.5988	186.6014	196.2021	176.2006	172.9014	154.8252	149.0083	163.0738	162.6496	182.6943	192.7802	206.6153	(64)
Efficiency of water heater (217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(216)
Fuel for water heating, kWh/month	236.4233	208.4932	219.2202	196.8722	193.1860	172.9891	166.4898	182.2053	181.7314	204.1277	215.3968	230.8551	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													4410.8144 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)													224.3461 (230a)
central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													254.3461 (231)
Electricity for lighting (calculated in Appendix L)													565.3557 (232)
Total delivered energy for all uses													7638.5061 (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	4410.8144	0.2160	952.7359 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2407.9900	0.2160	520.1258 (264)
Space and water heating			1472.8617 (265)
Pumps and fans	254.3461	0.5190	132.0056 (267)
Energy for lighting	565.3557	0.5190	293.4196 (268)
Total CO2, kg/year			1898.2869 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			20.9000 (273)

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

DER			20.9000 ZC1
Total Floor Area		TFA	90.8100
Assumed number of occupants		N	2.6366
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			15.6977 ZC2
CO2 emissions from cooking, equation (L16)			2.0073 ZC3
Total CO2 emissions			38.6050 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			38.6050 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	90.8100 (1b)	x 2.7000 (2b)	= 245.1870 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.8100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 245.1870 (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) = 0.1224 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3724 (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) =				0.3165 (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	0.4035	0.3956	0.3877	0.3482	0.3402	0.3007	0.3007	0.2928	0.3165	0.3402	0.3561	0.3719 (22b)
Effective ac	0.5814	0.5783	0.5752	0.5606	0.5579	0.5452	0.5452	0.5429	0.5501	0.5579	0.5634	0.5692 (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			2.0500	1.0000	2.0500		(26)
TER Semi-glazed door			20.6400	1.2000	24.7680		(26a)
Heat Loss Floor 1			90.8100	0.1300	11.8053		(28a)
External Wall 1	48.2700	22.6900	25.5800	0.1800	4.6044		(29a)
Stairs	13.8700		13.8700	0.1800	2.4966		(29a)
Bike store	14.2200		14.2200	0.1800	2.5596		(29a)
Corridor	15.0700		15.0700	0.1800	2.7126		(29a)
External Roof 1	24.0600		24.0600	0.1300	3.1278		(30)
Total net area of external elements Aum(A, m ²)			206.3000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	54.1243		(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)							5.5133 (36)
Total fabric heat loss						(33) + (36) =	59.6376 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	47.0439	46.7881	46.5373	45.3595	45.1392	44.1133	44.1133	43.9234	44.5085	45.1392	45.5849	46.0510 (38)
Heat transfer coeff	106.6815	106.4257	106.1749	104.9971	104.7768	103.7509	103.7509	103.5610	104.1461	104.7768	105.2225	105.6886 (39)
Average = Sum(39)m / 12 =												104.9961 (39)
HLP	1.1748	1.1720	1.1692	1.1562	1.1538	1.1425	1.1425	1.1404	1.1469	1.1538	1.1587	1.1638 (40)
HLP (average)												1.1562 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6366 (42)
Average daily hot water use (litres/day)												96.8203 (43)
Daily hot water use	106.5024	102.6296	98.7567	94.8839	91.0111	87.1383	87.1383	91.0111	94.8839	98.7567	102.6296	106.5024 (44)
Energy conte	157.9399	138.1353	142.5432	124.2726	119.2426	102.8973	95.3494	109.4149	110.7216	129.0354	140.8522	152.9564 (45)
Energy content (annual)										Total = Sum(45)m =		1523.3609 (45)
Distribution loss (46)m = 0.15 x (45)m	23.6910	20.7203	21.3815	18.6409	17.8864	15.4346	14.3024	16.4122	16.6082	19.3553	21.1278	22.9435 (46)
Water storage loss:												
Store volume												180.0000 (47)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

a) If manufacturer declared loss factor is known (kWh/day):	1.5520 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.8381 (55)
Total storage loss	
25.9803 23.4661 25.9803 25.1422 25.9803 25.1422 25.9803 25.9803 25.1422 25.9803 25.1422 25.9803 (56)	
If cylinder contains dedicated solar storage	
25.9803 23.4661 25.9803 25.1422 25.9803 25.1422 25.9803 25.9803 25.1422 25.9803 25.1422 25.9803 (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	
207.1826 182.6125 191.7859 171.9268 168.4852 150.5515 144.5921 158.6576 158.3758 178.2781 188.5064 202.1991 (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	
207.1826 182.6125 191.7859 171.9268 168.4852 150.5515 144.5921 158.6576 158.3758 178.2781 188.5064 202.1991 (64)	
Heat gains from water heating, kWh/month	
91.9092 81.5118 86.7898 79.4440 79.0423 72.3367 71.0978 75.7746 74.9383 82.2984 84.9567 90.2521 (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	
131.8323 131.8323 131.8323 131.8323 131.8323 131.8323 131.8323 131.8323 131.8323 131.8323 131.8323 131.8323 (66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
32.0128 28.4335 23.1236 17.5061 13.0860 11.0478 11.9375 15.5168 20.8266 26.4442 30.8643 32.9025 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
240.5601 243.0563 236.7658 223.3741 206.4695 190.5815 179.9673 177.4711 183.7616 197.1533 214.0579 229.9459 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
36.1832 36.1832 36.1832 36.1832 36.1832 36.1832 36.1832 36.1832 36.1832 36.1832 36.1832 36.1832 (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)	
-105.4658 -105.4658 -105.4658 -105.4658 -105.4658 -105.4658 -105.4658 -105.4658 -105.4658 -105.4658 -105.4658 -105.4658 (71)	
Water heating gains (Table 5)	
123.5338 121.2973 116.6529 110.3389 106.2396 100.4676 95.5616 101.8476 104.0810 110.6161 117.9954 121.3066 (72)	
Total internal gains	
461.6563 458.3368 442.0921 416.7688 391.3448 367.6466 353.0161 360.3851 374.2188 399.7633 428.4673 449.7047 (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
Solar gains	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (83)
Total gains	461.6563	458.3368	442.0921	416.7688	391.3448	367.6466 353.0161 360.3851 374.2188 399.7633 428.4673 449.7047 (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 59.1129 59.2550 59.3949 60.0612 60.1875 60.7826 60.7826 60.8941 60.5520 60.1875 59.9325 59.6682	
alpha 4.9409 4.9503 4.9597 5.0041 5.0125 5.0522 5.0522 5.0596 5.0368 5.0125 4.9955 4.9779	
util living area	
0.9991 0.9989 0.9985 0.9975 0.9938 0.9768 0.9216 0.9273 0.9817 0.9958 0.9985 0.9992 (86)	
MIT 19.6406 19.7066 19.8683 20.1170 20.3949 20.6843 20.8642 20.8527 20.6366 20.2853 19.9315 19.6319 (87)	
Th 2 19.9402 19.9425 19.9447 19.9552 19.9571 19.9663 19.9663 19.9680 19.9627 19.9571 19.9532 19.9490 (88)	
util rest of house	
0.9987 0.9985 0.9979 0.9962 0.9896 0.9546 0.8303 0.8452 0.9653 0.9934 0.9978 0.9989 (89)	
MIT 2 18.1195 18.2177 18.4559 18.8271 19.2338 19.6541 19.8811 19.8695 19.5848 19.0742 18.5544 18.1128 (90)	
Living area fraction	
MIT 18.7212 18.8066 19.0146 19.3373 19.6931 20.0616 20.2699 20.2584 20.0008 19.5532 19.0991 18.7137 (92)	
Temperature adjustment	
adjusted MIT 18.7212 18.8066 19.0146 19.3373 19.6931 20.0616 20.2699 20.2584 20.0008 19.5532 19.0991 18.7137 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9982	0.9979	0.9972	0.9951	0.9881	0.9574	0.8647	0.8749	0.9662	0.9920	0.9970	0.9984 (94)
Ext temp.	460.8115	457.3807	440.8329	414.7161	386.6961	351.9915	305.2413	315.3001	361.5541	396.5545	427.1851	448.9969 (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	1538.4709	1480.0225	1328.7354	1095.8884	837.4875	566.6444	380.7605	399.5784	614.5500	938.0911	1262.5769	1533.9313 (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	801.7786	687.2154	660.5995	490.4440	335.3888	0.0000	0.0000	0.0000	0.0000	402.9033	601.4821	807.1912 (98)
Space heating per m2												4787.0028 (98)
										(98) / (4) =		52.7145 (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													5119.7891 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	801.7786	687.2154	660.5995	490.4440	335.3888	0.0000	0.0000	0.0000	0.0000	402.9033	601.4821	807.1912	(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)	857.5172	734.9897	706.5235	524.5391	358.7046	0.0000	0.0000	0.0000	0.0000	430.9126	643.2963	863.3061	(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	207.1826	182.6125	191.7859	171.9268	168.4852	150.5515	144.5921	158.6576	158.3758	178.2781	188.5064	202.1991	(64)
Efficiency of water heater (217)m	88.0750	88.0222	87.8497	87.4562	86.6165	79.8000	79.8000	79.8000	79.8000	86.9247	87.6942	88.1328	(216)
Fuel for water heating, kWh/month	235.2343	207.4620	218.3115	196.5862	194.5186	188.6610	181.1931	198.8190	198.4660	205.0948	214.9588	229.4255	(219)
Water heating fuel used												2468.7308	(219)
Annual totals kWh/year													
Space heating fuel - main system												5119.7891	(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)												565.3557	(232)
Total delivered energy for all uses												8228.8756	(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	5119.7891	0.2160	1105.8745 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2468.7308	0.2160	533.2458 (264)
Space and water heating			1639.1203 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	565.3557	0.5190	293.4196 (268)
Total CO2, kg/m2/year			1971.4649 (272)
Emissions per m2 for space and water heating			18.0500 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			3.2311 (272b)
Emissions per m2 for pumps and fans			0.4286 (272c)
Target Carbon Dioxide Emission Rate (TER) = (18.0500 * 1.00) + 3.2311 + 0.4286, rounded to 2 d.p.			21.7100 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 2			Issued on Date	13/04/2022
Assessment Reference	Unit 2_Be Green	Prop Type Ref	160 Malden Road		
Property	160, Malden Road				
SAP Rating	83 B	DER	20.40	TER	30.04
Environmental	84 B	% DER<TER	32.10		
CO ₂ Emissions (t/year)	1.41	DFEE	59.75	TFEE	62.41
General Requirements Compliance	Pass	% DFEE<TFEE	4.27		
Assessor Details	Mr. Andy Love, Love Design Studio Ltd, Tel: 07563755762, Mail@lovedesignstudio.co.uk			Assessor ID	U860-0001
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 91 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

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 30.04 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 20.40 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 62.4 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 59.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.13 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.22 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.100

3 Air permeability

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

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric

Air-to-water heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 1.82 kWh/day	
Permitted by DBSCG 2.10	OK	
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
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Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK

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:	0.60	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley):	Not significant	OK
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Based on:

Overshading: Average

Air change rate: 2.00 ach

Blinds/curtains:

10 Key features

External wall U-value	0.14 W/m ² K
External wall U-value	0.14 W/m ² K
External wall U-value	0.14 W/m ² K
Party wall U-value	0.00 W/m ² K
Roof U-value	0.12 W/m ² K
Floor U-value	0.12 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	0.68 kW

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	90.8100 (1b)	x 2.7000 (2b)	= 245.1870 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.8100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 245.1870 (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
Half glazed doors			16.6800	1.2000	20.0160		(26a)
Solid Door			2.0500	1.4000	2.8700		(26)
Heat Loss Floor 1			90.8100	0.1200	10.8972		(28a)
External Wall 1	48.2700	18.7300	29.5400	0.1400	4.1356		(29a)
Stairs	13.8700		13.8700	0.1243	1.7245		(29a)
Bike store	14.2200		14.2200	0.1243	1.7680		(29a)
External Roof 1	24.0600		24.0600	0.1200	2.8872		(30)
Total net area of external elements Aum(A, m ²)			191.2300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.2985		(33)
Party Wall 1			44.6700	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 250.0000 (35)
Thermal bridges (User defined value 0.100 * total exposed area) 19.1230 (36)
Total fabric heat loss (33) + (36) = 63.4215 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 23.0042	Feb 22.7463	Mar 22.4884	Apr 21.1989	May 20.9410	Jun 19.6514	Jul 19.6514	Aug 19.3935	Sep 20.1672	Oct 20.9410	Nov 21.4568	Dec 21.9726 (38)
Heat transfer coeff	86.4258	86.1678	85.9099	84.6204	84.3625	83.0730	83.0730	82.8151	83.5888	84.3625	84.8783	85.3941 (39)
Average = Sum(39)m / 12 =												84.5559 (39)
HLP	Jan 0.9517	Feb 0.9489	Mar 0.9460	Apr 0.9318	May 0.9290	Jun 0.9148	Jul 0.9148	Aug 0.9120	Sep 0.9205	Oct 0.9290	Nov 0.9347	Dec 0.9404 (40)
HLP (average)												0.9311 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6366 (42)
Average daily hot water use (litres/day)												96.8203 (43)
Daily hot water use	Jan 106.5024	Feb 102.6296	Mar 98.7567	Apr 94.8839	May 91.0111	Jun 87.1383	Jul 87.1383	Aug 91.0111	Sep 94.8839	Oct 98.7567	Nov 102.6296	Dec 106.5024 (44)
Energy conte	157.9399	138.1353	142.5432	124.2726	119.2426	102.8973	95.3494	109.4149	110.7216	129.0354	140.8522	152.9564 (45)
Energy content (annual)												Total = Sum(45)m = 1523.3609 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	23.6910	20.7203	21.3815	18.6409	17.8864	15.4346	14.3024	16.4122	16.6082	19.3553	21.1278	22.9435 (46)
Water storage loss:												
Store volume												180.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0115 (51)
Volume factor from Table 2a												0.8736 (52)
Temperature factor from Table 2b												0.5400 (53)
Enter (49) or (54) in (55)												0.9805 (55)
Total storage loss	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (56)
If cylinder contains dedicated solar storage	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (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	211.5988	186.6014	196.2021	176.2006	172.9014	154.8252	149.0083	163.0738	162.6496	182.6943	192.7802	206.6153 (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	211.5988	186.6014	196.2021	176.2006	172.9014	154.8252	149.0083	163.0738	162.6496	182.6943	192.7802	206.6153 (64)
Total per year (kWh/year) = Sum(64)m =												2155.1510 (64)
Heat gains from water heating, kWh/month	95.4421	84.7029	90.3227	82.8630	82.5753	75.7557	74.6308	79.3076	78.3573	85.8314	88.3757	93.7851 (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	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	32.0128	28.4335	23.1236	17.5061	13.0860	11.0478	11.9375	15.5168	20.8266	26.4442	30.8643	32.9025 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	240.5601	243.0563	236.7658	223.3741	206.4695	190.5815	179.9673	177.4711	183.7616	197.1533	214.0579	229.9459 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832 (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)	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658 (71)
Water heating gains (Table 5)	128.2824	126.0459	121.4015	115.0875	110.9883	105.2163	100.3102	106.5962	108.8296	115.3648	122.7441	126.0553 (72)
Total internal gains	466.4050	463.0854	446.8407	421.5174	396.0934	372.3952	357.7647	365.1337	378.9675	404.5119	433.2159	454.4534 (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	
Solar gains	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (83)
Total gains	466.4050	463.0854	446.8407	421.5174	396.0934	372.3952

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)												
tau	72.9673	73.1857	73.4054	74.5240	74.7518	75.9122	75.9122	76.1486	75.4437	74.7518	74.2975	73.8488
alpha	5.8645	5.8790	5.8937	5.9683	5.9835	6.0608	6.0608	6.0766	6.0296	5.9835	5.9532	5.9233
util living area	0.9991	0.9989	0.9985	0.9970	0.9916	0.9623	0.8674	0.8762	0.9712	0.9947	0.9984	0.9992 (86)
MIT	19.9514	20.0073	20.1412	20.3499	20.5778	20.8128	20.9404	20.9340	20.7748	20.4882	20.1956	19.9457 (87)
Th 2	20.1238	20.1262	20.1285	20.1405	20.1429	20.1549	20.1549	20.1573	20.1501	20.1429	20.1381	20.1333 (88)
util rest of house	0.9988	0.9986	0.9979	0.9957	0.9865	0.9325	0.7647	0.7819	0.9493	0.9918	0.9977	0.9990 (89)
MIT 2	18.7067	18.7903	18.9881	19.3021	19.6355	19.9742	20.1206	20.1167	19.9194	19.5055	19.0748	18.7055 (90)
Living area fraction	19.1990	19.2717	19.4442	19.7166	20.0082	20.3059	20.4448	20.4400	20.2577	19.8942	19.5182	19.1961 (92)
MIT	19.1990	19.2717	19.4442	19.7166	20.0082	20.3059	20.4448	20.4400	20.2577	19.8942	19.5182	19.1961 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	465.6334	462.1915	445.5988	419.2841	390.3224	349.7813	288.1488	298.8807	361.1151	400.7420	431.9310	453.8188 (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	1287.6595	1238.3787	1112.0362	915.3030	700.9027	474.0067	319.4018	334.5720	514.7173	784.0827	1054.0318	1280.5765 (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	611.5874	521.5978	495.8294	357.1336	231.0718	0.0000	0.0000	0.0000	0.0000	285.2055	447.9126	615.1077 (98)
Space heating												3565.4458 (98)
Space heating per m2												39.2627 (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

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 %)													175.1000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2036.2340 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	611.5874	521.5978	495.8294	357.1336	231.0718	0.0000	0.0000	0.0000	0.0000	285.2055	447.9126	615.1077	(98)
Space heating efficiency (main heating system 1)	175.1000	175.1000	175.1000	175.1000	175.1000	0.0000	0.0000	0.0000	0.0000	175.1000	175.1000	175.1000	(210)
Space heating fuel (main heating system)	349.2789	297.8857	283.1693	203.9598	131.9656	0.0000	0.0000	0.0000	0.0000	162.8815	255.8039	351.2894	(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	211.5988	186.6014	196.2021	176.2006	172.9014	154.8252	149.0083	163.0738	162.6496	182.6943	192.7802	206.6153	(64)
Efficiency of water heater (217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)
Fuel for water heating, kWh/month	120.8446	106.5685	112.0515	100.6286	98.7444	88.4210	85.0990	93.1318	92.8895	104.3371	110.0972	117.9984	(219)
Water heating fuel used												1230.8115	(219)
Annual totals kWh/year													
Space heating fuel - main system												2036.2340	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)													224.3461 (230a)
central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													254.3461 (231)
Electricity for lighting (calculated in Appendix L)													565.3557 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.68 * 951 * 1.00) =										-517.1351			-517.1351 (233)
Total delivered energy for all uses													3569.6122 (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	2036.2340	0.5190	1056.8055 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1230.8115	0.5190	638.7912 (264)
Space and water heating			1695.5967 (265)
Pumps and fans	254.3461	0.5190	132.0056 (267)
Energy for lighting	565.3557	0.5190	293.4196 (268)
Energy saving/generation technologies			
PV Unit	-517.1351	0.5190	-268.3931 (269)
Total CO2, kg/year			1852.6287 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			20.4000 (273)

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

DER			20.4000 ZC1
Total Floor Area		TFA	90.8100
Assumed number of occupants		N	2.6366
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			15.6977 ZC2
CO2 emissions from cooking, equation (L16)			2.0073 ZC3
Total CO2 emissions			38.1050 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			38.1050 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	90.8100 (1b)	x 2.7000 (2b)	= 245.1870 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.8100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 245.1870 (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) = 0.1224 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3724 (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) =				0.3165 (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	0.4035	0.3956	0.3877	0.3482	0.3402	0.3007	0.3007	0.2928	0.3165	0.3402	0.3561	0.3719 (22b)
Effective ac	0.5814	0.5783	0.5752	0.5606	0.5579	0.5452	0.5452	0.5429	0.5501	0.5579	0.5634	0.5692 (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			2.0500	1.0000	2.0500		(26)
TER Semi-glazed door			16.6800	1.2000	20.0160		(26a)
Heat Loss Floor 1			90.8100	0.1300	11.8053		(28a)
External Wall 1	48.2700	18.7300	29.5400	0.1800	5.3172		(29a)
Stairs	13.8700		13.8700	0.1800	2.4966		(29a)
Bike store	14.2200		14.2200	0.1800	2.5596		(29a)
External Roof 1	24.0600		24.0600	0.1300	3.1278		(30)
Total net area of external elements Aum(A, m ²)			191.2300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.3725		(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)							5.2033 (36)
Total fabric heat loss						(33) + (36) =	52.5758 (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	47.0439	46.7881	46.5373	45.3595	45.1392	44.1133	44.1133	43.9234	44.5085	45.1392	45.5849	46.0510 (38)
Heat transfer coeff	99.6197	99.3639	99.1131	97.9353	97.7150	96.6891	96.6891	96.4992	97.0843	97.7150	98.1607	98.6268 (39)
Average = Sum(39)m / 12 =												97.9343 (39)
HLP	1.0970	1.0942	1.0914	1.0785	1.0760	1.0647	1.0647	1.0626	1.0691	1.0760	1.0809	1.0861 (40)
HLP (average)												1.0785 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6366 (42)
Average daily hot water use (litres/day)												96.8203 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	106.5024	102.6296	98.7567	94.8839	91.0111	87.1383	87.1383	91.0111	94.8839	98.7567	102.6296	106.5024 (44)
Energy content (annual)	157.9399	138.1353	142.5432	124.2726	119.2426	102.8973	95.3494	109.4149	110.7216	129.0354	140.8522	152.9564 (45)
Distribution loss (46)m = 0.15 x (45)m												1523.3609 (45)
Water storage loss:	23.6910	20.7203	21.3815	18.6409	17.8864	15.4346	14.3024	16.4122	16.6082	19.3553	21.1278	22.9435 (46)
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (48)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8381 (55)
Total storage loss												
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(56)
If cylinder contains dedicated solar storage												
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(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												
207.1826	182.6125	191.7859	171.9268	168.4852	150.5515	144.5921	158.6576	158.3758	178.2781	188.5064	202.1991	(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												
207.1826	182.6125	191.7859	171.9268	168.4852	150.5515	144.5921	158.6576	158.3758	178.2781	188.5064	202.1991	(64)
Total per year (kWh/year) = Sum(64)m =												2103.1537 (64)
Heat gains from water heating, kWh/month												
91.9092	81.5118	86.7898	79.4440	79.0423	72.3367	71.0978	75.7746	74.9383	82.2984	84.9567	90.2521	(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	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
32.0128	28.4335	23.1236	17.5061	13.0860	11.0478	11.9375	15.5168	20.8266	26.4442	30.8643	32.9025	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
240.5601	243.0563	236.7658	223.3741	206.4695	190.5815	179.9673	177.4711	183.7616	197.1533	214.0579	229.9459	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	(71)
Water heating gains (Table 5)												
123.5338	121.2973	116.6529	110.3389	106.2396	100.4676	95.5616	101.8476	104.0810	110.6161	117.9954	121.3066	(72)
Total internal gains	461.6563	458.3368	442.0921	416.7688	391.3448	367.6466	353.0161	360.3851	374.2188	399.7633	428.4673	449.7047 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	Specific data or Table 6c	FF Access factor Table 6d	Gains W
Solar gains	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (83)
Total gains	461.6563	458.3368	442.0921	416.7688	391.3448	367.6466 353.0161 360.3851 374.2188 399.7633 428.4673 449.7047 (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	63.3033	63.4662	63.6268	64.3920	64.5372	65.2219	65.2219	65.3503	64.9565	64.5372	64.2441	63.9405
alpha	5.2202	5.2311	5.2418	5.2928	5.3025	5.3481	5.3481	5.3567	5.3304	5.3025	5.2829	5.2627
util living area	0.9991	0.9990	0.9986	0.9974	0.9934	0.9740	0.9096	0.9161	0.9797	0.9957	0.9985	0.9992 (86)
MIT	19.7443	19.8069	19.9592	20.1939	20.4549	20.7261	20.8904	20.8805	20.6817	20.3519	20.0190	19.7364 (87)
Th 2	20.0033	20.0056	20.0078	20.0185	20.0205	20.0297	20.0297	20.0315	20.0262	20.0205	20.0164	20.0122 (88)
util rest of house	0.9988	0.9986	0.9980	0.9962	0.9891	0.9502	0.8150	0.8306	0.9622	0.9932	0.9979	0.9990 (89)
MIT 2	18.3158	18.4091	18.6335	18.9845	19.3665	19.7595	19.9622	19.9528	19.6952	19.2167	18.7273	18.3106 (90)
Living area fraction	18.8809	18.9620	19.1579	19.4628	19.7970	20.1418	20.3293	20.3198	fLA = Living area / (4) =	19.6657	19.2382	0.3956 (91)
MIT	18.8809	18.9620	19.1579	19.4628	19.7970	20.1418	20.3293	20.3198	20.0854	19.6657	19.2382	18.8746 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8809	18.9620	19.1579	19.4628	19.7970	20.1418	20.3293	20.3198	20.0854	19.6657	19.2382	18.8746 (93)

8. Space heating requirement

Utilisation	0.9983	0.9980	0.9973	0.9951	0.9878	0.9539	0.8513	0.8623	0.9637	0.9919	0.9971	0.9985 (94)
Useful gains	460.8622	457.4318	440.8813	414.7380	386.5558	350.7063	300.5123	310.7738	360.6203	396.5145	427.2299	449.0439 (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	1452.5434	1397.2549	1254.5628	1034.4760	791.1973	535.8341	360.5856	378.2530	581.0891	885.8571	1191.4992	1447.3097 (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	737.8108	631.5611	605.3790	446.2113	301.0533	0.0000	0.0000	0.0000	0.0000	364.0709	550.2739	742.7098 (98)
Space heating												4379.0701 (98)
Space heating per m2												(98) / (4) = 48.2223 (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													4683.4974 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	737.8108	631.5611	605.3790	446.2113	301.0533	0.0000	0.0000	0.0000	0.0000	364.0709	550.2739	742.7098	(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)	789.1025	675.4664	647.4642	477.2314	321.9821	0.0000	0.0000	0.0000	0.0000	389.3806	588.5282	794.3420	(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	207.1826	182.6125	191.7859	171.9268	168.4852	150.5515	144.5921	158.6576	158.3758	178.2781	188.5064	202.1991	(64)
Efficiency of water heater (217)m	87.9155	87.8577	87.6718	87.2462	86.3456	79.8000	79.8000	79.8000	79.8000	86.6795	87.5061	79.8000	(216)
Fuel for water heating, kWh/month	235.6610	207.8502	218.7544	197.0593	195.1290	188.6610	181.1931	198.8190	198.4660	205.6749	215.4208	229.8350	(219)
Water heating fuel used												2472.5237	(219)
Annual totals kWh/year													
Space heating fuel - main system												4683.4974	(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)												565.3557	(232)
Total delivered energy for all uses												7796.3768	(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	4683.4974	0.2160	1011.6354 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2472.5237	0.2160	534.0651 (264)
Space and water heating			1545.7006 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	565.3557	0.5190	293.4196 (268)
Total CO2, kg/m2/year			1878.0451 (272)
Emissions per m2 for space and water heating			17.0213 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			3.2311 (272b)
Emissions per m2 for pumps and fans			0.4286 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.0213 * 1.55) + 3.2311 + 0.4286, rounded to 2 d.p.			30.0400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 2			Issued on Date	13/04/2022
Assessment Reference	Unit 2_Be Lean	Prop Type Ref	160 Malden Road		
Property	160, Malden Road				
SAP Rating	82 B	DER	19.69	TER	20.68
Environmental	85 B	% DER<TER	4.79		
CO ₂ Emissions (t/year)	1.45	DFEE	59.75	TFEE	62.41
General Requirements Compliance	Pass	% DFEE<TFEE	4.27		
Assessor Details	Mr. Andy Love, Love Design Studio Ltd, Tel: 07563755762, Mail@lovedesignstudio.co.uk			Assessor ID	U860-0001
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 91 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
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 20.68 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 19.69 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 62.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 59.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.13 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.22 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.100

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
x x

Efficiency: 90%
Minimum: 88% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage Nominal cylinder loss: 1.82 kWh/day
Permitted by DBSCG 2.10 OK
Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK
Independent timer for DHW OK

Boiler interlock Yes OK

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: 0.60
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK

Based on:
Overshading: Average

Air change rate: 2.00 ach
Blinds/curtains:

10 Key features

External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Roof U-value 0.12 W/m²K
Floor U-value 0.12 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	90.8100 (1b)	x 2.7000 (2b)	= 245.1870 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.8100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 245.1870 (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
Half glazed doors			16.6800	1.2000	20.0160		(26a)
Solid Door			2.0500	1.4000	2.8700		(26)
Heat Loss Floor 1			90.8100	0.1200	10.8972		(28a)
External Wall 1	48.2700	18.7300	29.5400	0.1400	4.1356		(29a)
Stairs	13.8700		13.8700	0.1243	1.7245		(29a)
Bike store	14.2200		14.2200	0.1243	1.7680		(29a)
External Roof 1	24.0600		24.0600	0.1200	2.8872		(30)
Total net area of external elements Aum(A, m ²)			191.2300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.2985		(33)
Party Wall 1			44.6700	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K	250.0000 (35)
Thermal bridges (User defined value 0.100 * total exposed area)	19.1230 (36)
Total fabric heat loss	(33) + (36) = 63.4215 (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	23.0042	22.7463	22.4884	21.1989	20.9410	19.6514	19.6514	19.3935	20.1672	20.9410	21.4568	21.9726 (38)
Average = Sum(39)m / 12 =	86.4258	86.1678	85.9099	84.6204	84.3625	83.0730	83.0730	82.8151	83.5888	84.3625	84.8783	85.3941 (39)
												84.5559 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9517	0.9489	0.9460	0.9318	0.9290	0.9148	0.9148	0.9120	0.9205	0.9290	0.9347	0.9404 (40)
Days in month												0.9311 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6366 (42)
Average daily hot water use (litres/day)												96.8203 (43)
Daily hot water use	Jan 106.5024	Feb 102.6296	Mar 98.7567	Apr 94.8839	May 91.0111	Jun 87.1383	Jul 87.1383	Aug 91.0111	Sep 94.8839	Oct 98.7567	Nov 102.6296	Dec 106.5024 (44)
Energy conte	157.9399	138.1353	142.5432	124.2726	119.2426	102.8973	95.3494	109.4149	110.7216	129.0354	140.8522	152.9564 (45)
Energy content (annual)										Total = Sum(45)m =		1523.3609 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	23.6910	20.7203	21.3815	18.6409	17.8864	15.4346	14.3024	16.4122	16.6082	19.3553	21.1278	22.9435 (46)
Water storage loss:												
Store volume												180.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0115 (51)
Volume factor from Table 2a												0.8736 (52)
Temperature factor from Table 2b												0.5400 (53)
Enter (49) or (54) in (55)												0.9805 (55)
Total storage loss	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (56)
If cylinder contains dedicated solar storage	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (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	211.5988	186.6014	196.2021	176.2006	172.9014	154.8252	149.0083	163.0738	162.6496	182.6943	192.7802	206.6153 (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	211.5988	186.6014	196.2021	176.2006	172.9014	154.8252	149.0083	163.0738	162.6496	182.6943	192.7802	206.6153 (64)
Total per year (kWh/year) = Sum(64)m =												2155.1510 (64)
Heat gains from water heating, kWh/month	95.4421	84.7029	90.3227	82.8630	82.5753	75.7557	74.6308	79.3076	78.3573	85.8314	88.3757	93.7851 (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	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	32.0128	28.4335	23.1236	17.5061	13.0860	11.0478	11.9375	15.5168	20.8266	26.4442	30.8643	32.9025 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	240.5601	243.0563	236.7658	223.3741	206.4695	190.5815	179.9673	177.4711	183.7616	197.1533	214.0579	229.9459 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832 (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)	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658 (71)
Water heating gains (Table 5)	128.2824	126.0459	121.4015	115.0875	110.9883	105.2163	100.3102	106.5962	108.8296	115.3648	122.7441	126.0553 (72)
Total internal gains	466.4050	463.0854	446.8407	421.5174	396.0934	372.3952	357.7647	365.1337	378.9675	404.5119	433.2159	454.4534 (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	
Solar gains	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (83)
Total gains	466.4050	463.0854	446.8407	421.5174	396.0934	372.3952

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)												
tau	72.9673	73.1857	73.4054	74.5240	74.7518	75.9122	75.9122	76.1486	75.4437	74.7518	74.2975	73.8488
alpha	5.8645	5.8790	5.8937	5.9683	5.9835	6.0608	6.0608	6.0766	6.0296	5.9835	5.9532	5.9233
util living area	0.9991	0.9989	0.9985	0.9970	0.9916	0.9623	0.8674	0.8762	0.9712	0.9947	0.9984	0.9992 (86)
MIT	19.9514	20.0073	20.1412	20.3499	20.5778	20.8128	20.9404	20.9340	20.7748	20.4882	20.1956	19.9457 (87)
Th 2	20.1238	20.1262	20.1285	20.1405	20.1429	20.1549	20.1549	20.1573	20.1501	20.1429	20.1381	20.1333 (88)
util rest of house	0.9988	0.9986	0.9979	0.9957	0.9865	0.9325	0.7647	0.7819	0.9493	0.9918	0.9977	0.9990 (89)
MIT 2	18.7067	18.7903	18.9881	19.3021	19.6355	19.9742	20.1206	20.1167	19.9194	19.5055	19.0748	18.7055 (90)
Living area fraction	19.1990	19.2717	19.4442	19.7166	20.0082	20.3059	20.4448	20.4400	20.2577	19.8942	19.5182	19.1961 (92)
MIT	19.1990	19.2717	19.4442	19.7166	20.0082	20.3059	20.4448	20.4400	20.2577	19.8942	19.5182	19.1961 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.0490	19.1217	19.2942	19.5666	19.8582	20.1559	20.2948	20.2900	20.1077	19.7442	19.3682	19.0461 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	465.5909	462.1405	445.5207	419.1181	389.7952	347.2921	280.8795	292.0106	359.2048	400.4243	431.8461	453.7835 (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	1274.6956	1225.4535	1099.1497	902.6099	688.2483	461.5458	306.9408	322.1497	502.1790	771.4283	1041.3000	1267.7674 (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	601.9739	512.9463	486.2999	348.1141	222.0491	0.0000	0.0000	0.0000	0.0000	276.0270	438.8068	605.6040 (98)
Space heating												3491.8212 (98)
Space heating per m2												38.4519 (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

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 %)													89.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3901.4762 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	601.9739	512.9463	486.2999	348.1141	222.0491	0.0000	0.0000	0.0000	0.0000	276.0270	438.8068	605.6040	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	672.5966	573.1244	543.3519	388.9543	248.0995	0.0000	0.0000	0.0000	0.0000	308.4101	490.2870	676.6525	(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	211.5988	186.6014	196.2021	176.2006	172.9014	154.8252	149.0083	163.0738	162.6496	182.6943	192.7802	206.6153	(64)
Efficiency of water heater (217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(216)
Fuel for water heating, kWh/month	236.4233	208.4932	219.2202	196.8722	193.1860	172.9891	166.4898	182.2053	181.7314	204.1277	215.3968	230.8551	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													3901.4762 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)													224.3461 (230a)
central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													254.3461 (231)
Electricity for lighting (calculated in Appendix L)													565.3557 (232)
Total delivered energy for all uses													7129.1679 (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	3901.4762	0.2160	842.7189	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2407.9900	0.2160	520.1258	(264)
Space and water heating			1362.8447	(265)
Pumps and fans	254.3461	0.5190	132.0056	(267)
Energy for lighting	565.3557	0.5190	293.4196	(268)
Total CO2, kg/year			1788.2699	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			19.6900	(273)

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

DER			19.6900	ZC1
Total Floor Area		TFA	90.8100	
Assumed number of occupants		N	2.6366	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			15.6977	ZC2
CO2 emissions from cooking, equation (L16)			2.0073	ZC3
Total CO2 emissions			37.3950	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			37.3950	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	90.8100 (1b)	x 2.7000 (2b)	= 245.1870 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.8100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 245.1870 (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) = 0.1224 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3724 (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) =				0.3165 (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	0.4035	0.3956	0.3877	0.3482	0.3402	0.3007	0.3007	0.2928	0.3165	0.3402	0.3561	0.3719 (22b)
Effective ac	0.5814	0.5783	0.5752	0.5606	0.5579	0.5452	0.5452	0.5429	0.5501	0.5579	0.5634	0.5692 (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			2.0500	1.0000	2.0500		(26)
TER Semi-glazed door			16.6800	1.2000	20.0160		(26a)
Heat Loss Floor 1			90.8100	0.1300	11.8053		(28a)
External Wall 1	48.2700	18.7300	29.5400	0.1800	5.3172		(29a)
Stairs	13.8700		13.8700	0.1800	2.4966		(29a)
Bike store	14.2200		14.2200	0.1800	2.5596		(29a)
External Roof 1	24.0600		24.0600	0.1300	3.1278		(30)
Total net area of external elements Aum(A, m ²)			191.2300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.3725		(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)							5.2033 (36)
Total fabric heat loss						(33) + (36) =	52.5758 (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	47.0439	46.7881	46.5373	45.3595	45.1392	44.1133	44.1133	43.9234	44.5085	45.1392	45.5849	46.0510 (38)
Heat transfer coeff	99.6197	99.3639	99.1131	97.9353	97.7150	96.6891	96.6891	96.4992	97.0843	97.7150	98.1607	98.6268 (39)
Average = Sum(39)m / 12 =												97.9343 (39)
HLP	1.0970	1.0942	1.0914	1.0785	1.0760	1.0647	1.0647	1.0626	1.0691	1.0760	1.0809	1.0861 (40)
HLP (average)												1.0785 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6366 (42)
Average daily hot water use (litres/day)												96.8203 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	106.5024	102.6296	98.7567	94.8839	91.0111	87.1383	87.1383	91.0111	94.8839	98.7567	102.6296	106.5024 (44)
Energy content (annual)	157.9399	138.1353	142.5432	124.2726	119.2426	102.8973	95.3494	109.4149	110.7216	129.0354	140.8522	152.9564 (45)
Distribution loss (46)m = 0.15 x (45)m												1523.3609 (45)
Water storage loss:	23.6910	20.7203	21.3815	18.6409	17.8864	15.4346	14.3024	16.4122	16.6082	19.3553	21.1278	22.9435 (46)
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (48)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8381 (55)
Total storage loss												
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(56)
If cylinder contains dedicated solar storage												
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(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												
207.1826	182.6125	191.7859	171.9268	168.4852	150.5515	144.5921	158.6576	158.3758	178.2781	188.5064	202.1991	(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												
207.1826	182.6125	191.7859	171.9268	168.4852	150.5515	144.5921	158.6576	158.3758	178.2781	188.5064	202.1991	(64)
Heat gains from water heating, kWh/month												
91.9092	81.5118	86.7898	79.4440	79.0423	72.3367	71.0978	75.7746	74.9383	82.2984	84.9567	90.2521	(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	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	131.8323	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
32.0128	28.4335	23.1236	17.5061	13.0860	11.0478	11.9375	15.5168	20.8266	26.4442	30.8643	32.9025	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
240.5601	243.0563	236.7658	223.3741	206.4695	190.5815	179.9673	177.4711	183.7616	197.1533	214.0579	229.9459	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	36.1832	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	-105.4658	(71)
Water heating gains (Table 5)												
123.5338	121.2973	116.6529	110.3389	106.2396	100.4676	95.5616	101.8476	104.0810	110.6161	117.9954	121.3066	(72)
Total internal gains	461.6563	458.3368	442.0921	416.7688	391.3448	367.6466	353.0161	360.3851	374.2188	399.7633	428.4673	449.7047 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W
Solar gains	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (83)
Total gains	461.6563	458.3368	442.0921	416.7688	391.3448	367.6466	353.0161 (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	63.3033	63.4662	63.6268	64.3920	64.5372	65.2219	65.2219	65.3503	64.9565	64.5372	64.2441	63.9405
alpha	5.2202	5.2311	5.2418	5.2928	5.3025	5.3481	5.3481	5.3567	5.3304	5.3025	5.2829	5.2627
util living area	0.9991	0.9990	0.9986	0.9974	0.9934	0.9740	0.9096	0.9161	0.9797	0.9957	0.9985	0.9992 (86)
MIT	19.7443	19.8069	19.9592	20.1939	20.4549	20.7261	20.8904	20.8805	20.6817	20.3519	20.0190	19.7364 (87)
Th 2	20.0033	20.0056	20.0078	20.0185	20.0205	20.0297	20.0297	20.0315	20.0262	20.0205	20.0164	20.0122 (88)
util rest of house	0.9988	0.9986	0.9980	0.9962	0.9891	0.9502	0.8150	0.8306	0.9622	0.9932	0.9979	0.9990 (89)
MIT 2	18.3158	18.4091	18.6335	18.9845	19.3665	19.7595	19.9622	19.9528	19.6952	19.2167	18.7273	18.3106 (90)
Living area fraction	18.8809	18.9620	19.1579	19.4628	19.7970	20.1418	20.3293	20.3198	fLA = Living area / (4) =	19.6657	19.2382	0.3956 (91)
MIT	18.8809	18.9620	19.1579	19.4628	19.7970	20.1418	20.3293	20.3198	20.0854	19.6657	19.2382	18.8746 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8809	18.9620	19.1579	19.4628	19.7970	20.1418	20.3293	20.3198	20.0854	19.6657	19.2382	18.8746 (93)

8. Space heating requirement

Utilisation	0.9983	0.9980	0.9973	0.9951	0.9878	0.9539	0.8513	0.8623	0.9637	0.9919	0.9971	0.9985 (94)
Useful gains	460.8622	457.4318	440.8813	414.7380	386.5558	350.7063	300.5123	310.7738	360.6203	396.5145	427.2299	449.0439 (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	1452.5434	1397.2549	1254.5628	1034.4760	791.1973	535.8341	360.5856	378.2530	581.0891	885.8571	1191.4992	1447.3097 (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	737.8108	631.5611	605.3790	446.2113	301.0533	0.0000	0.0000	0.0000	0.0000	364.0709	550.2739	742.7098 (98)
Space heating												4379.0701 (98)
Space heating per m2												(98) / (4) = 48.2223 (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													4683.4974 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	737.8108	631.5611	605.3790	446.2113	301.0533	0.0000	0.0000	0.0000	0.0000	364.0709	550.2739	742.7098	(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)	789.1025	675.4664	647.4642	477.2314	321.9821	0.0000	0.0000	0.0000	0.0000	389.3806	588.5282	794.3420	(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	207.1826	182.6125	191.7859	171.9268	168.4852	150.5515	144.5921	158.6576	158.3758	178.2781	188.5064	202.1991	(64)
Efficiency of water heater (217)m	87.9155	87.8577	87.6718	87.2462	86.3456	79.8000	79.8000	79.8000	79.8000	86.6795	87.5061	79.8000	(216)
Fuel for water heating, kWh/month	235.6610	207.8502	218.7544	197.0593	195.1290	188.6610	181.1931	198.8190	198.4660	205.6749	215.4208	229.8350	(219)
Water heating fuel used												2472.5237	(219)
Annual totals kWh/year													
Space heating fuel - main system												4683.4974	(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)												565.3557	(232)
Total delivered energy for all uses												7796.3768	(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	4683.4974	0.2160	1011.6354 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2472.5237	0.2160	534.0651 (264)
Space and water heating			1545.7006 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	565.3557	0.5190	293.4196 (268)
Total CO2, kg/m2/year			1878.0451 (272)
Emissions per m2 for space and water heating			17.0213 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			3.2311 (272b)
Emissions per m2 for pumps and fans			0.4286 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.0213 * 1.00) + 3.2311 + 0.4286, rounded to 2 d.p.			20.6800 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 3			Issued on Date	13/04/2022
Assessment Reference	Unit 3_Be Green	Prop Type Ref	160 Malden Road		
Property					
SAP Rating	83 B	DER	21.17	TER	32.27
Environmental	85 B	% DER<TER	34.41		
CO ₂ Emissions (t/year)	1.22	DFEE	61.46	TFEE	65.64
General Requirements Compliance	Pass	% DFEE<TFEE	6.37		
Assessor Details	Mr. Andy Love, Love Design Studio Ltd, Tel: 07563755762, Mail@lovedesignstudio.co.uk			Assessor ID	U860-0001
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 76 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

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 32.27 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 21.17 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)65.6 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)61.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.16 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.23 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.100

3 Air permeability

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

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric

Air-to-water heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 1.82 kWh/day	
Permitted by DBSCG 2.10	OK	
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
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Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK

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:	0.60	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley):	Slight	OK
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Based on:

Overshading:	Average
Windows facing East:	0.84 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	0.12 W/m ² K
Floor U-value	0.12 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	0.68 kW

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	75.6400 (1b)	x 2.7000 (2b)	= 204.2280 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	75.6400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.2280 (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					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (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	0.2987	0.2952	0.2917	0.2744	0.2709	0.2536	0.2536	0.2501	0.2605	0.2709	0.2778	0.2848 (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					
windows (Uw = 1.20)			0.8400	1.1450	0.9618		(27)					
Half glazed doors			13.2500	1.2000	15.9000		(26a)					
Solid Door			2.0500	1.4000	2.8700		(26)					
Heat Loss Floor 1			75.6400	0.1200	9.0768		(28a)					
External Wall 1	72.5300	16.1400	56.3900	0.1600	9.0224		(29a)					
External Roof 1	15.6500		15.6500	0.1200	1.8780		(30)					
Total net area of external elements Aum(A, m2)			163.8200				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	39.7090		(33)					
Party Wall 1			32.1300	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (User defined value 0.100 * total exposed area)							16.3820 (36)					
Total fabric heat loss							(33) + (36) = 56.0910 (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	20.1280	19.8942	19.6605	18.4916	18.2578	17.0889	17.0889	16.8551	17.5565	18.2578	18.7253	19.1929 (38)
Average = Sum(39)m / 12 =	76.2190	75.9853	75.7515	74.5826	74.3488	73.1799	73.1799	72.9462	73.6475	74.3488	74.8164	75.2839 (39)
												74.5242 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0077	1.0046	1.0015	0.9860	0.9829	0.9675	0.9675	0.9644	0.9737	0.9829	0.9891	0.9953 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3749 (42)
Average daily hot water use (litres/day)												90.6047 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	99.6652	96.0410	92.4168	88.7926	85.1684	81.5442	81.5442	85.1684	88.7926	92.4168	96.0410	99.6652 (44)
Energy conte	147.8006	129.2673	133.3923	116.2946	111.5875	96.2915	89.2282	102.3907	103.6136	120.7516	131.8098	143.1370 (45)
Energy content (annual)												Total = Sum(45)m = 1425.5647 (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

22.1701	19.3901	20.0088	17.4442	16.7381	14.4437	13.3842	15.3586	15.5420	18.1127	19.7715	21.4705 (46)
Water storage loss:											
Store volume											180.0000 (47)
b) If manufacturer declared loss factor is not known :											
Hot water storage loss factor from Table 2 (kWh/litre/day)											0.0115 (51)
Volume factor from Table 2a											0.8736 (52)
Temperature factor from Table 2b											0.5400 (53)
Enter (49) or (54) in (55)											0.9805 (55)
Total storage loss											
30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (56)
If cylinder contains dedicated solar storage											
30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (57)
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)
Primary loss											
Total heat required for water heating calculated for each month											
201.4594	177.7334	187.0512	168.2226	165.2463	148.2195	142.8871	156.0496	155.5415	174.4105	183.7378	196.7958 (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											
201.4594	177.7334	187.0512	168.2226	165.2463	148.2195	142.8871	156.0496	155.5415	174.4105	183.7378	196.7958 (64)
Heat gains from water heating, kWh/month											
92.0708	81.7543	87.2800	80.2103	80.0299	73.5593	72.5955	76.9720	75.9939	83.0770	85.3691	90.5201 (65)
Total per year (kWh/year) = Sum(64)m =											2057.3547 (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	118.7467	118.7467	118.7467	118.7467	118.7467	118.7467	118.7467	118.7467	118.7467	118.7467	118.7467 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5											
27.0787	24.0511	19.5597	14.8079	11.0691	9.3450	10.0976	13.1252	17.6167	22.3684	26.1073	27.8313 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											
210.0879	212.2680	206.7743	195.0790	180.3157	166.4402	157.1706	154.9905	160.4842	172.1796	186.9429	200.8183 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
34.8747	34.8747	34.8747	34.8747	34.8747	34.8747	34.8747	34.8747	34.8747	34.8747	34.8747	34.8747 (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)											
-94.9974	-94.9974	-94.9974	-94.9974	-94.9974	-94.9974	-94.9974	-94.9974	-94.9974	-94.9974	-94.9974	-94.9974 (71)
Water heating gains (Table 5)											
123.7511	121.6581	117.3119	111.4032	107.5671	102.1657	97.5746	103.4570	105.5470	111.6627	118.5682	121.6669 (72)
Total internal gains											
422.5418	419.6012	405.2699	382.9141	360.5759	339.5749	326.4668	333.1968	345.2719	367.8347	393.2424	411.9405 (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		
East	0.8400		19.6403		0.6300		0.7000		0.7700		5.0419 (76)
Solar gains	5.0419	9.8631	16.2432	23.6897	29.0326	29.7200	28.2947	24.3047	18.8915	11.7034	4.1463 (83)
Total gains	427.5837	429.4644	421.5131	406.6038	389.6085	369.2949	354.7615	357.5015	364.1634	379.5381	416.0868 (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	68.9169	69.1289	69.3422	70.4290	70.6504	71.7789	71.7789	72.0090	71.3232	70.6504	70.2089
alpha	5.5945	5.6086	5.6228	5.6953	5.7100	5.7853	5.7853	5.8006	5.7549	5.7100	5.6806
util living area	0.9985	0.9982	0.9972	0.9941	0.9831	0.9332	0.8083	0.8246	0.9535	0.9912	0.9973
MIT	19.9217	19.9865	20.1347	20.3623	20.6051	20.8411	20.9548	20.9476	20.7935	20.4916	20.1795
Th 2	20.0770	20.0795	20.0821	20.0950	20.0976	20.1105	20.1105	20.1131	20.1053	20.0976	20.0924
util rest of house	0.9980	0.9975	0.9961	0.9914	0.9734	0.8874	0.6894	0.7144	0.9210	0.9864	0.9962
MIT 2	18.6286	18.7252	18.9438	19.2855	19.6379	19.9684	20.0873	20.0840	19.9045	19.4754	19.0170
Living area fraction	19.2379	19.3195	19.5049	19.7929	20.0936	20.3796	20.4960	20.4909	fLA = Living area / (4) =	19.5647	19.5647
MIT	19.2379	19.3195	19.5049	19.7929	20.0936	20.3796	20.4960	20.4909	20.3234	19.9542	19.5647
Temperature adjustment											0.0000
adjusted MIT	19.2379	19.3195	19.5049	19.7929	20.0936	20.3796	20.4960	20.4909	20.3234	19.9542	19.5647

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9974	0.9968	0.9951	0.9902	0.9734	0.9038	0.7663	0.9306	0.9854	0.9954	0.9978 (94)
Useful gains	426.4676	428.0952	419.4675	402.6236	379.2327	333.7734	264.6641	338.9069	374.0145	397.6716	415.1649 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W											
1138.5547	1095.6675	985.1426	812.4196	624.0539	422.9503	285.1120	298.4178	458.3386	695.4717	932.5665	1131.7883 (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											
529.7928	448.6086	420.8623	295.0531	182.1470	0.0000	0.0000	0.0000	0.0000	239.1642	385.1243	533.1678 (98)
Space heating											
Space heating per m2											3033.9200 (98)
(98) / (4) =											40.1100 (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

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 %)													175.1000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1732.6785 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	529.7928	448.6086	420.8623	295.0531	182.1470	0.0000	0.0000	0.0000	0.0000	239.1642	385.1243	533.1678	(98)
Space heating efficiency (main heating system 1)	175.1000	175.1000	175.1000	175.1000	175.1000	0.0000	0.0000	0.0000	0.0000	175.1000	175.1000	175.1000	(210)
Space heating fuel (main heating system)	302.5658	256.2014	240.3554	168.5055	104.0245	0.0000	0.0000	0.0000	0.0000	136.5872	219.9454	304.4933	(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	201.4594	177.7334	187.0512	168.2226	165.2463	148.2195	142.8871	156.0496	155.5415	174.4105	183.7378	196.7958	(64)
Efficiency of water heater	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)
Fuel for water heating, kWh/month	115.0539	101.5039	106.8253	96.0723	94.3726	84.6485	81.6031	89.1203	88.8301	99.6062	104.9331	112.3905	(219)
Water heating fuel used												1174.9599	(219)
Annual totals kWh/year													
Space heating fuel - main system												1732.6785	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)													186.8686 (230a)
central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													216.8686 (231)
Electricity for lighting (calculated in Appendix L)													478.2191 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.68 * 951 * 1.00) =										-517.1351		-517.1351	(233)
Total delivered energy for all uses												3085.5910	(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	1732.6785	0.5190	899.2601 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1174.9599	0.5190	609.8042 (264)
Space and water heating			1509.0643 (265)
Pumps and fans	216.8686	0.5190	112.5548 (267)
Energy for lighting	478.2191	0.5190	248.1957 (268)
Energy saving/generation technologies			
PV Unit	-517.1351	0.5190	-268.3931 (269)
Total CO2, kg/year			1601.4217 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			21.1700 (273)

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

DER			21.1700 ZC1
Total Floor Area		TFA	75.6400
Assumed number of occupants		N	2.3749
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.4587 ZC2
CO2 emissions from cooking, equation (L16)			2.3268 ZC3
Total CO2 emissions			39.9555 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			39.9555 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	75.6400 (1b)	x 2.7000 (2b)	= 204.2280 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	75.6400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.2280 (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) = 0.1469 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3969 (18)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3671 (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	0.4681	0.4589	0.4497	0.4038	0.3947	0.3488	0.3488	0.3396	0.3671	0.3947	0.4130	0.4314 (22b)
Effective ac	0.6096	0.6053	0.6011	0.5815	0.5779	0.5608	0.5608	0.5577	0.5674	0.5779	0.5853	0.5930 (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			2.0500	1.0000	2.0500			(26)					
TER Semi-glazed door			13.2500	1.2000	15.9000			(26a)					
TER Opening Type (Uw = 1.40)			0.8400	1.3258	1.1136			(27)					
Heat Loss Floor 1			75.6400	0.1300	9.8332			(28a)					
External Wall 1	72.5300	16.1400	56.3900	0.1800	10.1502			(29a)					
External Roof 1	15.6500		15.6500	0.1300	2.0345			(30)					
Total net area of external elements Aum(A, m2)			163.8200					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.0815			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								6.7496 (36)					
Total fabric heat loss						(33) + (36) =		47.8311 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 41.0810	Feb 40.7943	Mar 40.5132	Apr 39.1933	May 38.9463	Jun 37.7966	Jul 37.7966	Aug 37.5837	Sep 38.2395	Oct 38.9463	Nov 39.4459	Dec 39.9682	(38)
Heat transfer coeff	88.9121	88.6254	88.3444	87.0244	86.7774	85.6278	85.6278	85.4149	86.0706	86.7774	87.2770	87.7994	(39)
Average = Sum(39)m / 12 =												87.0232	(39)
HLP	Jan 1.1755	Feb 1.1717	Mar 1.1680	Apr 1.1505	May 1.1472	Jun 1.1320	Jul 1.1320	Aug 1.1292	Sep 1.1379	Oct 1.1472	Nov 1.1538	Dec 1.1608	(40)
HLP (average)												1.1505	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3749 (42)
Average daily hot water use (litres/day)												90.6047 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	99.6652	96.0410	92.4168	88.7926	85.1684	81.5442	81.5442	85.1684	88.7926	92.4168	96.0410	99.6652 (44)
Energy conte	147.8006	129.2673	133.3923	116.2946	111.5875	96.2915	89.2282	102.3907	103.6136	120.7516	131.8098	143.1370 (45)
Energy content (annual)											Total = Sum(45)m =	1425.5647 (45)
Distribution loss (46)m = 0.15 x (45)m												
	22.1701	19.3901	20.0088	17.4442	16.7381	14.4437	13.3842	15.3586	15.5420	18.1127	19.7715	21.4705 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (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)												0.8381 (55)
Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (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	197.0432	173.7446	182.6350	163.9488	160.8301	143.9457	138.4709	151.6334	151.2678	169.9943	179.4640	192.3796 (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	197.0432	173.7446	182.6350	163.9488	160.8301	143.9457	138.4709	151.6334	151.2678	169.9943	179.4640	192.3796 (64)
Heat gains from water heating, kWh/month	88.5378	78.5632	83.7471	76.7913	76.4970	70.1403	69.0625	73.4390	72.5749	79.5441	81.9501	86.9872 (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	118.7467	118.7467	118.7467	118.7467	118.7467	118.7467	118.7467	118.7467	118.7467	118.7467	118.7467	118.7467	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.0787	24.0511	19.5597	14.8079	11.0691	9.3450	10.0976	13.1252	17.6167	22.3684	26.1073	27.8313	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	210.0879	212.2680	206.7743	195.0790	180.3157	166.4402	157.1706	154.9905	160.4842	172.1796	186.9429	200.8183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.8747	34.8747	34.8747	34.8747	34.8747	34.8747	34.8747	34.8747	34.8747	34.8747	34.8747	34.8747	(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)	-94.9974	-94.9974	-94.9974	-94.9974	-94.9974	-94.9974	-94.9974	-94.9974	-94.9974	-94.9974	-94.9974	-94.9974	(71)
Water heating gains (Table 5)	119.0025	116.9095	112.5633	106.6546	102.8185	97.4171	92.8260	98.7084	100.7984	106.9140	113.8196	116.9182	(72)
Total internal gains	417.7932	414.8526	400.5213	378.1655	355.8273	334.8263	321.7182	328.4482	340.5233	363.0861	388.4938	407.1919	(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	

East				0.8400	19.6403	0.6300		0.7000	0.7700		5.0419 (76)	

Solar gains	5.0419	9.8631	16.2432	23.6897	29.0326	29.7200	28.2947	24.3047	18.8915	11.7034	6.2867	4.1463 (83)
Total gains	422.8351	424.7157	416.7644	401.8552	384.8599	364.5463	350.0128	352.7529	359.4148	374.7895	394.7805	411.3382 (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	59.0783	59.2694	59.4580	60.3598	60.5316	61.3443	61.3443	61.4972	61.0287	60.5316	60.1851	59.8271
alpha	4.9386	4.9513	4.9639	5.0240	5.0354	5.0896	5.0896	5.0998	5.0686	5.0354	5.0123	4.9885
util living area	0.9986	0.9983	0.9974	0.9951	0.9873	0.9541	0.8650	0.8776	0.9675	0.9930	0.9976	0.9988 (86)
MIT	19.6867	19.7597	19.9291	20.1892	20.4695	20.7506	20.9078	20.8961	20.6937	20.3412	19.9834	19.6813 (87)
Th 2	19.9397	19.9427	19.9457	19.9598	19.9624	19.9747	19.9747	19.9770	19.9700	19.9624	19.9571	19.9515 (88)
util rest of house	0.9981	0.9976	0.9964	0.9927	0.9793	0.9163	0.7468	0.7707	0.9412	0.9889	0.9965	0.9983 (89)
MIT 2	18.1865	18.2954	18.5453	18.9351	19.3437	19.7445	19.9244	19.9156	19.6657	19.1586	18.6328	18.1868 (90)
Living area fraction									fLA = Living area / (4) =			0.4712 (91)
MIT	18.8934	18.9853	19.1973	19.5260	19.8741	20.2186	20.3878	20.3776	20.1501	19.7158	19.2692	18.8910 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8934	18.9853	19.1973	19.5260	19.8741	20.2186	20.3878	20.3776	20.1501	19.7158	19.2692	18.8910 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	421.7114	423.3672	414.8374	398.3803	376.5524	338.1547	280.8441	289.2444	340.4086	370.1530	393.0374	410.4009	(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	1297.5272	1248.3169	1121.7393	924.7190	709.3297	481.1041	324.3377	339.7468	520.7336	791.0473	1062.0921	1289.8560	(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	651.6070	554.3662	525.9350	378.9639	247.5863	0.0000	0.0000	0.0000	0.0000	313.1453	481.7194	654.3146	(98)
Space heating												3807.6377	(98)
Space heating per m2												50.3389	(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													4072.3398 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	651.6070	554.3662	525.9350	378.9639	247.5863	0.0000	0.0000	0.0000	0.0000	313.1453	481.7194	654.3146	(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)	696.9059	592.9050	562.4973	405.3090	264.7982	0.0000	0.0000	0.0000	0.0000	334.9148	515.2079	699.8017	(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	197.0432	173.7446	182.6350	163.9488	160.8301	143.9457	138.4709	151.6334	151.2678	169.9943	179.4640	192.3796	(64)
Efficiency of water heater (217)m	87.7676	87.6941	87.4767	86.9782	85.9611	79.8000	79.8000	79.8000	79.8000	86.4227	87.3220	79.8000	(216)
Fuel for water heating, kWh/month	224.5057	198.1256	208.7812	188.4942	187.0963	180.3831	173.5224	190.0168	189.5586	196.7009	205.5199	219.0504	(219)
Water heating fuel used												2361.7552	(219)
Annual totals kWh/year													
Space heating fuel - main system												4072.3398	(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)												478.2191	(232)
Total delivered energy for all uses												6987.3142	(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	4072.3398	0.2160	879.6254 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2361.7552	0.2160	510.1391 (264)
Space and water heating			1389.7645 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	478.2191	0.5190	248.1957 (268)
Total CO2, kg/m2/year			1676.8853 (272)
Emissions per m2 for space and water heating			18.3734 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			3.2813 (272b)
Emissions per m2 for pumps and fans			0.5146 (272c)
Target Carbon Dioxide Emission Rate (TER) = (18.3734 * 1.55) + 3.2813 + 0.5146, rounded to 2 d.p.			32.2700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 3			Issued on Date	13/04/2022
Assessment Reference	Unit 3_Be Lean	Prop Type Ref	160 Malden Road		
Property					
SAP Rating	82 B	DER	20.81	TER	22.17
Environmental	85 B	% DER<TER	6.13		
CO ₂ Emissions (t/year)	1.28	DFEE	61.46	TFEE	65.64
General Requirements Compliance	Pass	% DFEE<TFEE	6.37		
Assessor Details	Mr. Andy Love, Love Design Studio Ltd, Tel: 07563755762, Mail@lovedesignstudio.co.uk			Assessor ID	9990-1318
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 76 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
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 22.17 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 20.81 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)65.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)61.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.16 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.23 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.100

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
x x

Efficiency: 90%
Minimum: 88% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage Nominal cylinder loss: 1.82 kWh/day
Permitted by DBSCG 2.10 OK
Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK
Independent timer for DHW OK

Boiler interlock Yes OK

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: 0.60
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 East: 0.84 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 0.12 W/m²K
Floor U-value 0.12 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	75.6400 (1b)	x 2.7000 (2b)	= 204.2280 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	75.6400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.2280 (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					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (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	0.2987	0.2952	0.2917	0.2744	0.2709	0.2536	0.2536	0.2501	0.2605	0.2709	0.2778	0.2848 (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					
windows (Uw = 1.20)			0.8400	1.1450	0.9618		(27)					
Half glazed doors			13.2500	1.2000	15.9000		(26a)					
Solid Door			2.0500	1.4000	2.8700		(26)					
Heat Loss Floor 1			75.6400	0.1200	9.0768		(28a)					
External Wall 1	72.5300	16.1400	56.3900	0.1600	9.0224		(29a)					
External Roof 1	15.6500		15.6500	0.1200	1.8780		(30)					
Total net area of external elements Aum(A, m2)			163.8200				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		39.7090		(33)					
Party Wall 1			32.1300	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (User defined value 0.100 * total exposed area)							16.3820 (36)					
Total fabric heat loss							(33) + (36) = 56.0910 (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	20.1280	19.8942	19.6605	18.4916	18.2578	17.0889	17.0889	16.8551	17.5565	18.2578	18.7253	19.1929 (38)
Average = Sum(39)m / 12 =	76.2190	75.9853	75.7515	74.5826	74.3488	73.1799	73.1799	72.9462	73.6475	74.3488	74.8164	75.2839 (39)
												74.5242 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0077	1.0046	1.0015	0.9860	0.9829	0.9675	0.9675	0.9644	0.9737	0.9829	0.9891	0.9953 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3749 (42)
Average daily hot water use (litres/day)												90.6047 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	99.6652	96.0410	92.4168	88.7926	85.1684	81.5442	81.5442	85.1684	88.7926	92.4168	96.0410	99.6652 (44)
Energy conte	147.8006	129.2673	133.3923	116.2946	111.5875	96.2915	89.2282	102.3907	103.6136	120.7516	131.8098	143.1370 (45)
Energy content (annual)												Total = Sum(45)m = 1425.5647 (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

22.1701	19.3901	20.0088	17.4442	16.7381	14.4437	13.3842	15.3586	15.5420	18.1127	19.7715	21.4705 (46)
Water storage loss:											
Store volume											180.0000 (47)
b) If manufacturer declared loss factor is not known :											
Hot water storage loss factor from Table 2 (kWh/litre/day)											0.0115 (51)
Volume factor from Table 2a											0.8736 (52)
Temperature factor from Table 2b											0.5400 (53)
Enter (49) or (54) in (55)											0.9805 (55)
Total storage loss											
30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (56)
If cylinder contains dedicated solar storage											
30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (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											
201.4594	177.7334	187.0512	168.2226	165.2463	148.2195	142.8871	156.0496	155.5415	174.4105	183.7378	196.7958 (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											
201.4594	177.7334	187.0512	168.2226	165.2463	148.2195	142.8871	156.0496	155.5415	174.4105	183.7378	196.7958 (64)
Total per year (kWh/year) = Sum(64)m =											2057.3547 (64)
Heat gains from water heating, kWh/month											
92.0708	81.7543	87.2800	80.2103	80.0299	73.5593	72.5955	76.9720	75.9939	83.0770	85.3691	90.5201 (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	118.7467	118.7467	118.7467	118.7467	118.7467	118.7467	118.7467	118.7467	118.7467	118.7467	118.7467 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5											
27.0787	24.0511	19.5597	14.8079	11.0691	9.3450	10.0976	13.1252	17.6167	22.3684	26.1073	27.8313 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											
210.0879	212.2680	206.7743	195.0790	180.3157	166.4402	157.1706	154.9905	160.4842	172.1796	186.9429	200.8183 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
34.8747	34.8747	34.8747	34.8747	34.8747	34.8747	34.8747	34.8747	34.8747	34.8747	34.8747	34.8747 (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)											
-94.9974	-94.9974	-94.9974	-94.9974	-94.9974	-94.9974	-94.9974	-94.9974	-94.9974	-94.9974	-94.9974	-94.9974 (71)
Water heating gains (Table 5)											
123.7511	121.6581	117.3119	111.4032	107.5671	102.1657	97.5746	103.4570	105.5470	111.6627	118.5682	121.6669 (72)
Total internal gains											
422.5418	419.6012	405.2699	382.9141	360.5759	339.5749	326.4668	333.1968	345.2719	367.8347	393.2424	411.9405 (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		
East	0.8400		19.6403		0.6300		0.7000		0.7700		5.0419 (76)
Solar gains	5.0419	9.8631	16.2432	23.6897	29.0326	29.7200	28.2947	24.3047	18.8915	11.7034	6.2867
Total gains	427.5837	429.4644	421.5131	406.6038	389.6085	369.2949	354.7615	357.5015	364.1634	379.5381	399.5291
											416.0868 (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	68.9169	69.1289	69.3422	70.4290	70.6504	71.7789	71.7789	72.0090	71.3232	70.6504	70.2089
alpha	5.5945	5.6086	5.6228	5.6953	5.7100	5.7853	5.7853	5.8006	5.7549	5.7100	5.6806
util living area	0.9985	0.9982	0.9972	0.9941	0.9831	0.9332	0.8083	0.8246	0.9535	0.9912	0.9973
											0.9987 (86)
MIT	19.9217	19.9865	20.1347	20.3623	20.6051	20.8411	20.9548	20.9476	20.7935	20.4916	20.1795
Th 2	20.0770	20.0795	20.0821	20.0950	20.0976	20.1105	20.1105	20.1131	20.1053	20.0976	20.0924
util rest of house											
	0.9980	0.9975	0.9961	0.9914	0.9734	0.8874	0.6894	0.7144	0.9210	0.9864	0.9962
MIT 2	18.6286	18.7252	18.9438	19.2855	19.6379	19.9684	20.0873	20.0840	19.9045	19.4754	19.0170
Living area fraction									fLA = Living area / (4) =		
MIT	19.2379	19.3195	19.5049	19.7929	20.0936	20.3796	20.4960	20.4909	20.3234	19.9542	19.5647
Temperature adjustment											-0.1500
adjusted MIT	19.0879	19.1695	19.3549	19.6429	19.9436	20.2296	20.3460	20.3409	20.1734	19.8042	19.4147
											19.0836 (93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9973	0.9966	0.9949	0.9895	0.9712	0.8950	0.7466	0.9242	0.9843	0.9951	0.9977 (94)
Useful gains	426.4099	428.0222	419.3480	402.3527	378.3914	330.5052	257.1653	266.9049	336.5485	373.5870	397.5569
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W											
1127.1218	1084.2697	973.7799	801.2322	612.9016	411.9733	274.1350	287.4759	447.2915	684.3194	921.3440	1120.4957 (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											
521.3297	440.9984	412.4973	287.1932	174.4756	0.0000	0.0000	0.0000	0.0000	231.1849	377.1267	524.8019 (98)
Space heating											2969.6077 (98)
Space heating per m2											(98) / (4) = 39.2598 (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

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 %)													89.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3317.9974 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	521.3297	440.9984	412.4973	287.1932	174.4756	0.0000	0.0000	0.0000	0.0000	231.1849	377.1267	524.8019	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	582.4913	492.7356	460.8908	320.8863	194.9448	0.0000	0.0000	0.0000	0.0000	258.3071	421.3706	586.3708	(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	201.4594	177.7334	187.0512	168.2226	165.2463	148.2195	142.8871	156.0496	155.5415	174.4105	183.7378	196.7958	(64)
Efficiency of water heater (217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(216)
Fuel for water heating, kWh/month	225.0944	198.5848	208.9957	187.9582	184.6328	165.6083	159.6504	174.3571	173.7894	194.8721	205.2936	219.8836	(219)
Water heating fuel used												2298.7204	(219)
Annual totals kWh/year													
Space heating fuel - main system												3317.9974	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)													186.8686 (230a)
central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													216.8686 (231)
Electricity for lighting (calculated in Appendix L)													478.2191 (232)
Total delivered energy for all uses													6311.8055 (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	3317.9974	0.2160	716.6874	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2298.7204	0.2160	496.5236	(264)
Space and water heating			1213.2110	(265)
Pumps and fans	216.8686	0.5190	112.5548	(267)
Energy for lighting	478.2191	0.5190	248.1957	(268)
Total CO2, kg/year			1573.9616	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			20.8100	(273)

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

DER			20.8100	ZC1
Total Floor Area		TFA	75.6400	
Assumed number of occupants		N	2.3749	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.4587	ZC2
CO2 emissions from cooking, equation (L16)			2.3268	ZC3
Total CO2 emissions			39.5955	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			39.5955	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	75.6400 (1b)	x 2.7000 (2b)	= 204.2280 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	75.6400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.2280 (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) = 0.1469 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3969 (18)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3671 (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	0.4681	0.4589	0.4497	0.4038	0.3947	0.3488	0.3488	0.3396	0.3671	0.3947	0.4130	0.4314 (22b)
Effective ac	0.6096	0.6053	0.6011	0.5815	0.5779	0.5608	0.5608	0.5577	0.5674	0.5779	0.5853	0.5930 (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			2.0500	1.0000	2.0500			(26)					
TER Semi-glazed door			13.2500	1.2000	15.9000			(26a)					
TER Opening Type (Uw = 1.40)			0.8400	1.3258	1.1136			(27)					
Heat Loss Floor 1			75.6400	0.1300	9.8332			(28a)					
External Wall 1	72.5300	16.1400	56.3900	0.1800	10.1502			(29a)					
External Roof 1	15.6500		15.6500	0.1300	2.0345			(30)					
Total net area of external elements Aum(A, m2)			163.8200					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	41.0815			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								6.7496 (36)					
Total fabric heat loss						(33) + (36) =		47.8311 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 41.0810	Feb 40.7943	Mar 40.5132	Apr 39.1933	May 38.9463	Jun 37.7966	Jul 37.7966	Aug 37.5837	Sep 38.2395	Oct 38.9463	Nov 39.4459	Dec 39.9682	(38)
Heat transfer coeff	88.9121	88.6254	88.3444	87.0244	86.7774	85.6278	85.6278	85.4149	86.0706	86.7774	87.2770	87.7994	(39)
Average = Sum(39)m / 12 =												87.0232	(39)
HLP	Jan 1.1755	Feb 1.1717	Mar 1.1680	Apr 1.1505	May 1.1472	Jun 1.1320	Jul 1.1320	Aug 1.1292	Sep 1.1379	Oct 1.1472	Nov 1.1538	Dec 1.1608	(40)
HLP (average)												1.1505	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3749 (42)
Average daily hot water use (litres/day)												90.6047 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	99.6652	96.0410	92.4168	88.7926	85.1684	81.5442	81.5442	85.1684	88.7926	92.4168	96.0410	99.6652 (44)
Energy conte	147.8006	129.2673	133.3923	116.2946	111.5875	96.2915	89.2282	102.3907	103.6136	120.7516	131.8098	143.1370 (45)
Energy content (annual)											Total = Sum(45)m =	1425.5647 (45)
Distribution loss (46)m = 0.15 x (45)m												
	22.1701	19.3901	20.0088	17.4442	16.7381	14.4437	13.3842	15.3586	15.5420	18.1127	19.7715	21.4705 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (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)												0.8381 (55)
Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (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	197.0432	173.7446	182.6350	163.9488	160.8301	143.9457	138.4709	151.6334	151.2678	169.9943	179.4640	192.3796 (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	197.0432	173.7446	182.6350	163.9488	160.8301	143.9457	138.4709	151.6334	151.2678	169.9943	179.4640	192.3796 (64)
Heat gains from water heating, kWh/month	88.5378	78.5632	83.7471	76.7913	76.4970	70.1403	69.0625	73.4390	72.5749	79.5441	81.9501	86.9872 (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	118.7467	118.7467	118.7467	118.7467	118.7467	118.7467	118.7467	118.7467	118.7467	118.7467	118.7467	118.7467	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.0787	24.0511	19.5597	14.8079	11.0691	9.3450	10.0976	13.1252	17.6167	22.3684	26.1073	27.8313	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	210.0879	212.2680	206.7743	195.0790	180.3157	166.4402	157.1706	154.9905	160.4842	172.1796	186.9429	200.8183	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.8747	34.8747	34.8747	34.8747	34.8747	34.8747	34.8747	34.8747	34.8747	34.8747	34.8747	34.8747	(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)	-94.9974	-94.9974	-94.9974	-94.9974	-94.9974	-94.9974	-94.9974	-94.9974	-94.9974	-94.9974	-94.9974	-94.9974	(71)
Water heating gains (Table 5)	119.0025	116.9095	112.5633	106.6546	102.8185	97.4171	92.8260	98.7084	100.7984	106.9140	113.8196	116.9182	(72)
Total internal gains	417.7932	414.8526	400.5213	378.1655	355.8273	334.8263	321.7182	328.4482	340.5233	363.0861	388.4938	407.1919	(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					

East			0.8400	19.6403	0.6300	0.7000	0.7700	5.0419 (76)				

Solar gains	5.0419	9.8631	16.2432	23.6897	29.0326	29.7200	28.2947	24.3047	18.8915	11.7034	6.2867	4.1463 (83)
Total gains	422.8351	424.7157	416.7644	401.8552	384.8599	364.5463	350.0128	352.7529	359.4148	374.7895	394.7805	411.3382 (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	59.0783	59.2694	59.4580	60.3598	60.5316	61.3443	61.3443	61.4972	61.0287	60.5316	60.1851	59.8271
alpha	4.9386	4.9513	4.9639	5.0240	5.0354	5.0896	5.0896	5.0998	5.0686	5.0354	5.0123	4.9885
util living area	0.9986	0.9983	0.9974	0.9951	0.9873	0.9541	0.8650	0.8776	0.9675	0.9930	0.9976	0.9988 (86)
MIT	19.6867	19.7597	19.9291	20.1892	20.4695	20.7506	20.9078	20.8961	20.6937	20.3412	19.9834	19.6813 (87)
Th 2	19.9397	19.9427	19.9457	19.9598	19.9624	19.9747	19.9747	19.9770	19.9700	19.9624	19.9571	19.9515 (88)
util rest of house	0.9981	0.9976	0.9964	0.9927	0.9793	0.9163	0.7468	0.7707	0.9412	0.9889	0.9965	0.9983 (89)
MIT 2	18.1865	18.2954	18.5453	18.9351	19.3437	19.7445	19.9244	19.9156	19.6657	19.1586	18.6328	18.1868 (90)
Living area fraction									fLA = Living area / (4) =			0.4712 (91)
MIT	18.8934	18.9853	19.1973	19.5260	19.8741	20.2186	20.3878	20.3776	20.1501	19.7158	19.2692	18.8910 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8934	18.9853	19.1973	19.5260	19.8741	20.2186	20.3878	20.3776	20.1501	19.7158	19.2692	18.8910 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	421.7114	423.3672	414.8374	398.3803	376.5524	338.1547	280.8441	289.2444	340.4086	370.1530	393.0374	410.4009	(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	1297.5272	1248.3169	1121.7393	924.7190	709.3297	481.1041	324.3377	339.7468	520.7336	791.0473	1062.0921	1289.8560	(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	651.6070	554.3662	525.9350	378.9639	247.5863	0.0000	0.0000	0.0000	0.0000	313.1453	481.7194	654.3146	(98)
Space heating												3807.6377	(98)
Space heating per m2												50.3389	(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													4072.3398 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	651.6070	554.3662	525.9350	378.9639	247.5863	0.0000	0.0000	0.0000	0.0000	313.1453	481.7194	654.3146	(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)	696.9059	592.9050	562.4973	405.3090	264.7982	0.0000	0.0000	0.0000	0.0000	334.9148	515.2079	699.8017	(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	197.0432	173.7446	182.6350	163.9488	160.8301	143.9457	138.4709	151.6334	151.2678	169.9943	179.4640	192.3796	(64)
Efficiency of water heater (217)m	87.7676	87.6941	87.4767	86.9782	85.9611	79.8000	79.8000	79.8000	79.8000	86.4227	87.3220	79.8000	(216)
Fuel for water heating, kWh/month	224.5057	198.1256	208.7812	188.4942	187.0963	180.3831	173.5224	190.0168	189.5586	196.7009	205.5199	219.0504	(219)
Water heating fuel used												2361.7552	(219)
Annual totals kWh/year													
Space heating fuel - main system												4072.3398	(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)												478.2191	(232)
Total delivered energy for all uses												6987.3142	(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	4072.3398	0.2160	879.6254 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2361.7552	0.2160	510.1391 (264)
Space and water heating			1389.7645 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	478.2191	0.5190	248.1957 (268)
Total CO2, kg/m2/year			1676.8853 (272)
Emissions per m2 for space and water heating			18.3734 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			3.2813 (272b)
Emissions per m2 for pumps and fans			0.5146 (272c)
Target Carbon Dioxide Emission Rate (TER) = (18.3734 * 1.00) + 3.2813 + 0.5146, rounded to 2 d.p.			22.1700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 4			Issued on Date	13/04/2022
Assessment Reference	Unit 4_Be Green	Prop Type Ref	160 Malden Road		
Property	160, Malden Road				
SAP Rating	85 B	DER	18.13	TER	28.08
Environmental	86 B	% DER<TER	35.44		
CO ₂ Emissions (t/year)	1.19	DFEE	52.60	TFEE	56.30
General Requirements Compliance	Pass	% DFEE<TFEE	6.57		
Assessor Details	Mr. Andy Love, Love Design Studio Ltd, Tel: 07563755762, Mail@lovedesignstudio.co.uk			Assessor ID	U860-0001
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

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 28.08 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 18.13 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)56.3 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)52.6 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.23 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.100

3 Air permeability

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

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric

Air-to-water heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 1.82 kWh/day	
Permitted by DBSCG 2.10	OK	
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
-------------------------	-----------------------------------	----

Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK

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:	0.60	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley):	Slight	OK
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Based on:

Overshading:	Average
Windows facing West:	3.30 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

External wall U-value	0.14 W/m ² K
External wall U-value	0.14 W/m ² K
Party wall U-value	0.00 W/m ² K
Roof U-value	0.12 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	0.68 kW

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	87.7500 (1b)	x 2.7000 (2b)	= 236.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.7500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 236.9250 (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							1	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.9250 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1388 (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)
	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (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	0.2987	0.2952	0.2917	0.2744	0.2709	0.2536	0.2536	0.2501	0.2605	0.2709	0.2778	0.2848 (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					
windows (Uw = 1.20)			3.3000	1.1450	3.7786		(27)					
Half glazed doors			10.3900	1.2000	12.4680		(26a)					
Solid Door			2.0500	1.4000	2.8700		(26)					
External Wall 1	80.0000	15.7400	64.2600	0.1400	8.9964		(29a)					
Corridor	7.6400		7.6400	0.1321	1.0089		(29a)					
External Roof 1	78.5600		78.5600	0.1200	9.4272		(30)					
Total net area of external elements Aum(A, m2)			166.2000				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	38.5491		(33)					
Party Wall 1			16.3100	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (User defined value 0.100 * total exposed area)							16.6200 (36)					
Total fabric heat loss							(33) + (36) = 55.1691 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 23.3505	Feb 23.0793	Mar 22.8081	Apr 21.4521	May 21.1809	Jun 19.8248	Jul 19.8248	Aug 19.5536	Sep 20.3673	Oct 21.1809	Nov 21.7233	Dec 22.2657 (38)
Heat transfer coeff	78.5196	78.2484	77.9772	76.6212	76.3500	74.9939	74.9939	74.7227	75.5363	76.3500	76.8924	77.4348 (39)
Average = Sum(39)m / 12 =												76.5534 (39)
HLP	Jan 0.8948	Feb 0.8917	Mar 0.8886	Apr 0.8732	May 0.8701	Jun 0.8546	Jul 0.8546	Aug 0.8515	Sep 0.8608	Oct 0.8701	Nov 0.8763	Dec 0.8824 (40)
HLP (average)												0.8724 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5937 (42)
Average daily hot water use (litres/day)												95.7993 (43)
Daily hot water use	Jan 105.3792	Feb 101.5472	Mar 97.7153	Apr 93.8833	May 90.0513	Jun 86.2193	Jul 86.2193	Aug 90.0513	Sep 93.8833	Oct 97.7153	Nov 101.5472	Dec 105.3792 (44)
Energy conte	156.2743	136.6785	141.0400	122.9621	117.9850	101.8121	94.3439	108.2610	109.5540	127.6746	139.3668	151.3433 (45)
Energy content (annual)												Total = Sum(45)m = 1507.2956 (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

	23.4411	20.5018	21.1560	18.4443	17.6978	15.2718	14.1516	16.2391	16.4331	19.1512	20.9050	22.7015 (46)
Water storage loss:												
Store volume												180.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0115 (51)
Volume factor from Table 2a												0.8736 (52)
Temperature factor from Table 2b												0.5400 (53)
Enter (49) or (54) in (55)												0.9805 (55)
Total storage loss												
30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965	(56)
If cylinder contains dedicated solar storage												
30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965	(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												
209.9332	185.1446	194.6989	174.8900	171.6439	153.7401	148.0028	161.9199	161.4819	181.3335	191.2948	205.0022	(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												
209.9332	185.1446	194.6989	174.8900	171.6439	153.7401	148.0028	161.9199	161.4819	181.3335	191.2948	205.0022	(64)
Heat gains from water heating, kWh/month												
94.8883	84.2185	89.8229	82.4272	82.1571	75.3949	74.2964	78.9239	77.9691	85.3789	87.8818	93.2488	(65)
Total per year (kWh/year) = Sum(64)m =												2139.0856 (64)

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

Metabolic gains (Table 5), Watts												
(66)m	129.6827	129.6827	129.6827	129.6827	129.6827	129.6827	129.6827	129.6827	129.6827	129.6827	129.6827	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
28.1275	24.9826	20.3172	15.3814	11.4978	9.7069	10.4887	13.6336	18.2989	23.2347	27.1183	28.9092	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
234.8769	237.3142	231.1723	218.0969	201.5917	186.0790	175.7156	173.2784	179.4202	192.4956	209.0009	224.5135	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
35.9683	35.9683	35.9683	35.9683	35.9683	35.9683	35.9683	35.9683	35.9683	35.9683	35.9683	35.9683	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	(71)
Water heating gains (Table 5)												
127.5381	125.3251	120.7297	114.4823	110.4262	104.7151	99.8608	106.0805	108.2904	114.7566	122.0581	125.3344	(72)
Total internal gains												
455.4472	452.5266	437.1240	412.8654	388.4205	365.4059	350.9699	357.8972	370.9143	395.3917	423.0821	443.6619	(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												
West												
3.3000												
19.6403												
0.6300												
0.7000												
0.7700												
19.8077												(80)
Solar gains	19.8077	38.7480	63.8124	93.0666	114.0566	116.7572	111.1576	95.4828	74.2165	45.9777	24.6978	16.2889 (83)
Total gains	475.2549	491.2746	500.9364	505.9320	502.4771	482.1631	462.1276	453.3800	445.1308	441.3694	447.7799	459.9507 (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	77.6080	77.8770	78.1478	79.5309	79.8134	81.2566	81.5515	80.6731	79.8134	79.2504	78.6953	
alpha	6.1739	6.1918	6.2099	6.3021	6.3209	6.4171	6.4171	6.4368	6.3782	6.3209	6.2834	6.2464
util living area												
0.9988	0.9982	0.9964	0.9899	0.9643	0.8632	0.6884	0.7228	0.9224	0.9890	0.9975	0.9990	(86)
MIT	20.0610	20.1359	20.2903	20.5195	20.7457	20.9279	20.9866	20.9819	20.8750	20.5968	20.2992	20.0533 (87)
Th 2	20.1719	20.1745	20.1772	20.1904	20.1930	20.2062	20.2062	20.2089	20.2009	20.1930	20.1877	20.1824 (88)
util rest of house												
0.9984	0.9976	0.9951	0.9856	0.9469	0.7993	0.5773	0.6157	0.8790	0.9834	0.9966	0.9987	(89)
MIT 2	18.9031	19.0147	19.2423	19.5854	19.9078	20.1482	20.2001	20.1998	20.0858	19.7002	19.2637	18.9000 (90)
Living area fraction												
MIT	19.2884	19.3878	19.5910	19.8963	20.1866	20.4077	20.4619	20.4601	20.3484	19.9985	19.6082	19.2838 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2884	19.3878	19.5910	19.8963	20.1866	20.4077	20.4619	20.4601	20.3484	19.9985	19.6082	19.2838 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.9978	0.9968	0.9938	0.9835	0.9467	0.8174	0.6147	0.6516	0.8884	0.9816	0.9956	0.9982	(94)
Useful gains	474.2038	489.7002	497.8498	497.7017	475.7017	394.1370	284.0518	295.4170	395.4607	433.2673	445.8100	459.1233 (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												
1176.8854	1133.6447	1020.8012	842.5468	647.9534	435.5388	289.6157	303.3788	471.9838	717.5769	961.7890	1168.0101	(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												
522.7951	432.7307	389.0758	248.3558	128.1553	0.0000	0.0000	0.0000	0.0000	211.5263	371.5049	527.4118	(98)
Space heating												2831.5557 (98)
Space heating per m2												32.2684 (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

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 %)													175.1000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1617.1078 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	522.7951	432.7307	389.0758	248.3558	128.1553	0.0000	0.0000	0.0000	0.0000	211.5263	371.5049	527.4118	(98)
Space heating efficiency (main heating system 1)	175.1000	175.1000	175.1000	175.1000	175.1000	0.0000	0.0000	0.0000	0.0000	175.1000	175.1000	175.1000	(210)
Space heating fuel (main heating system)	298.5695	247.1335	222.2021	141.8366	73.1898	0.0000	0.0000	0.0000	0.0000	120.8032	212.1673	301.2060	(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	209.9332	185.1446	194.6989	174.8900	171.6439	153.7401	148.0028	161.9199	161.4819	181.3335	191.2948	205.0022	(64)
Efficiency of water heater	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)
(217)m	119.8933	105.7365	111.1930	99.8801	98.0262	87.8013	84.5247	92.4728	92.2227	103.5600	109.2489	117.0772	(219)
Fuel for water heating, kWh/month													(219)
Water heating fuel used													1221.6366
Annual totals kWh/year													
Space heating fuel - main system													1617.1078 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)													216.7864 (230a)
central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													246.7864 (231)
Electricity for lighting (calculated in Appendix L)													496.7399 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.68 * 951 * 1.00) =													-517.1351 (233)
Total delivered energy for all uses													3065.1356 (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	1617.1078	0.5190	839.2789 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1221.6366	0.5190	634.0294 (264)
Space and water heating			1473.3083 (265)
Pumps and fans	246.7864	0.5190	128.0821 (267)
Energy for lighting	496.7399	0.5190	257.8080 (268)
Energy saving/generation technologies			
PV Unit	-517.1351	0.5190	-268.3931 (269)
Total CO2, kg/year			1590.8054 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			18.1300 (273)

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

DER			18.1300 ZC1
Total Floor Area		TFA	87.7500
Assumed number of occupants		N	2.5937
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			15.8613 ZC2
CO2 emissions from cooking, equation (L16)			2.0655 ZC3
Total CO2 emissions			36.0568 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			36.0568 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	87.7500 (1b)	x 2.7000 (2b)	= 236.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.7500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 236.9250 (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)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.1266 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.3766	(18)
Number of sides sheltered				1	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3484 (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	0.4442	0.4355	0.4268	0.3832	0.3745	0.3310	0.3310	0.3222	0.3484	0.3745	0.3919	0.4093 (22b)
Effective ac	0.5986	0.5948	0.5911	0.5734	0.5701	0.5548	0.5548	0.5519	0.5607	0.5701	0.5768	0.5838 (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			2.0500	1.0000	2.0500			(26)					
TER Semi-glazed door			10.3900	1.2000	12.4680			(26a)					
TER Opening Type (Uw = 1.40)			3.3000	1.3258	4.3750			(27)					
External Wall 1	80.0000	15.7400	64.2600	0.1800	11.5668			(29a)					
Corridor	7.6400		7.6400	0.1800	1.3752			(29a)					
External Roof 1	78.5600		78.5600	0.1300	10.2128			(30)					
Total net area of external elements Aum(A, m2)			166.2000					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.0478			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								4.7836 (36)					
Total fabric heat loss						(33) + (36) =	46.8314	(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	46.8054	46.5059	46.2123	44.8335	44.5755	43.3745	43.3745	43.1521	43.8371	44.5755	45.0974	45.6430	(38)
Heat transfer coeff	93.6368	93.3373	93.0437	91.6649	91.4069	90.2059	90.2059	89.9835	90.6685	91.4069	91.9288	92.4744	(39)
Average = Sum(39)m / 12 =												91.6636	(39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0671	1.0637	1.0603	1.0446	1.0417	1.0280	1.0280	1.0255	1.0333	1.0417	1.0476	1.0538	(40)
HLP (average)												1.0446	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5937 (42)
Average daily hot water use (litres/day)												95.7993 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	105.3792	101.5472	97.7153	93.8833	90.0513	86.2193	86.2193	90.0513	93.8833	97.7153	101.5472	105.3792 (44)
Energy conte	156.2743	136.6785	141.0400	122.9621	117.9850	101.8121	94.3439	108.2610	109.5540	127.6746	139.3668	151.3433 (45)
Energy content (annual)											Total = Sum(45)m =	1507.2956 (45)
Distribution loss	(46)m = 0.15 x (45)m											
	23.4411	20.5018	21.1560	18.4443	17.6978	15.2718	14.1516	16.2391	16.4331	19.1512	20.9050	22.7015 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (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)												0.8381 (55)
Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (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	205.5170	181.1558	190.2826	170.6163	167.2277	149.4663	143.5866	157.5037	157.2082	176.9173	187.0210	200.5860 (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	205.5170	181.1558	190.2826	170.6163	167.2277	149.4663	143.5866	157.5037	157.2082	176.9173	187.0210	200.5860 (64)
Heat gains from water heating, kWh/month	91.3553	81.0274	86.2899	79.0082	78.6242	71.9759	70.7635	75.3909	74.5501	81.8459	84.4628	89.7158 (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	129.6827	129.6827	129.6827	129.6827	129.6827	129.6827	129.6827	129.6827	129.6827	129.6827	129.6827	129.6827	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.1275	24.9826	20.3172	15.3814	11.4978	9.7069	10.4887	13.6336	18.2989	23.2347	27.1183	28.9092	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	234.8769	237.3142	231.1723	218.0969	201.5917	186.0790	175.7156	173.2784	179.4202	192.4956	209.0009	224.5135	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.9683	35.9683	35.9683	35.9683	35.9683	35.9683	35.9683	35.9683	35.9683	35.9683	35.9683	35.9683	(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)	-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	(71)
Water heating gains (Table 5)	122.7894	120.5765	115.9811	109.7337	105.6776	99.9665	95.1122	101.3319	103.5417	110.0080	117.3095	120.5857	(72)
Total internal gains	450.6986	447.7780	432.3754	408.1168	383.6719	360.6573	346.2213	353.1486	366.1657	390.6431	418.3335	438.9133	(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			3.3000	19.6403	0.6300	0.7000	0.7700	19.8077 (80)				

Solar gains	19.8077	38.7480	63.8124	93.0666	114.0566	116.7572	111.1576	95.4828	74.2165	45.9777	24.6978	16.2889 (83)
Total gains	470.5062	486.5260	496.1878	501.1834	497.7285	477.4145	457.3789	448.6314	440.3822	436.6208	443.0313	455.2021 (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	65.0786	65.2874	65.4934	66.4786	66.6662	67.5538	67.5538	67.7207	67.2091	66.6662	66.2877	65.8966
alpha	5.3386	5.3525	5.3662	5.4319	5.4444	5.5036	5.5036	5.5147	5.4806	5.4444	5.4192	5.3931
util living area	0.9989	0.9984	0.9970	0.9926	0.9768	0.9143	0.7805	0.8105	0.9518	0.9921	0.9979	0.9991 (86)
MIT	19.8114	19.8942	20.0704	20.3326	20.6027	20.8458	20.9563	20.9449	20.7742	20.4350	20.0886	19.8030 (87)
Th 2	20.0278	20.0306	20.0334	20.0463	20.0487	20.0601	20.0601	20.0622	20.0557	20.0487	20.0438	20.0387 (88)
util rest of house	0.9985	0.9978	0.9959	0.9893	0.9637	0.8591	0.6535	0.6935	0.9177	0.9878	0.9970	0.9987 (89)
MIT 2	18.4316	18.5546	18.8142	19.2058	19.5955	19.9280	20.0389	20.0326	19.8381	19.3573	18.8487	18.4272 (90)
Living area fraction									fLA = Living area / (4) =			0.3228 (91)
MIT	18.8907	19.0004	19.2322	19.5807	19.9306	20.2334	20.3442	20.3362	20.1496	19.7159	19.2613	18.8850 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8907	19.0004	19.2322	19.5807	19.9306	20.2334	20.3442	20.3362	20.1496	19.7159	19.2613	18.8850 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9978	0.9969	0.9945	0.9870	0.9616	0.8714	0.6962	0.7320	0.9220	0.9857	0.9960	0.9982	(94)
Useful gains	469.4635	485.0325	493.4744	494.6558	478.6285	416.0063	318.4052	328.4159	406.0468	430.3633	441.2534	454.3680	(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	1366.2289	1316.0894	1184.6519	979.0463	752.3371	508.1689	337.7480	354.1923	548.5116	833.2597	1117.9723	1357.9870	(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	667.1935	558.4702	514.2360	348.7612	203.6392	0.0000	0.0000	0.0000	0.0000	299.7549	487.2376	672.2925	(98)
Space heating												3751.5852	(98)
Space heating per m2												42.7531	(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													4012.3906 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	667.1935	558.4702	514.2360	348.7612	203.6392	0.0000	0.0000	0.0000	0.0000	299.7549	487.2376	672.2925	(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)	713.5759	597.2944	549.9851	373.0066	217.7959	0.0000	0.0000	0.0000	0.0000	320.5935	521.1098	719.0294	(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	205.5170	181.1558	190.2826	170.6163	167.2277	149.4663	143.5866	157.5037	157.2082	176.9173	187.0210	200.5860	(64)
Efficiency of water heater (217)m	87.7298	87.6224	87.3371	86.6819	85.3403	79.8000	79.8000	79.8000	79.8000	86.2097	87.2549	79.8000	(216)
Fuel for water heating, kWh/month	234.2612	206.7460	217.8715	196.8303	195.9540	187.3011	179.9330	197.3730	197.0027	205.2173	214.3388	228.4713	(219)
Water heating fuel used												2461.3004	(219)
Annual totals kWh/year													
Space heating fuel - main system												4012.3906	(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)												496.7399	(232)
Total delivered energy for all uses												7045.4309	(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	4012.3906	0.2160	866.6764 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2461.3004	0.2160	531.6409 (264)
Space and water heating			1398.3173 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	496.7399	0.5190	257.8080 (268)
Total CO2, kg/m2/year			1695.0503 (272)
Emissions per m2 for space and water heating			15.9352 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.9380 (272b)
Emissions per m2 for pumps and fans			0.4436 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.9352 * 1.55) + 2.9380 + 0.4436, rounded to 2 d.p.			28.0800 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 4			Issued on Date	13/04/2022
Assessment Reference	Unit 4_Be Lean	Prop Type Ref	160 Malden Road		
Property	160, Malden Road				
SAP Rating	83 B	DER	17.89	TER	19.32
Environmental	86 B	% DER<TER	7.39		
CO ₂ Emissions (t/year)	1.27	DFEE	52.60	TFEE	56.30
General Requirements Compliance	Pass	% DFEE<TFEE	6.57		
Assessor Details	Mr. Andy Love, Love Design Studio Ltd, Tel: 07563755762, Mail@lovedesignstudio.co.uk			Assessor ID	U860-0001
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
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 19.32 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.89 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)56.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)52.6 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.23 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.100

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
x x

Efficiency: 90%
Minimum: 88% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage Nominal cylinder loss: 1.82 kWh/day
Permitted by DBSCG 2.10 OK
Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK
Independent timer for DHW OK

Boiler interlock Yes OK

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: 0.60
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 West: 3.30 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Roof U-value 0.12 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	87.7500 (1b)	x 2.7000 (2b)	= 236.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.7500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 236.9250 (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								1	(19)			
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.9250	(20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1388	(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)
	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (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	0.2987	0.2952	0.2917	0.2744	0.2709	0.2536	0.2536	0.2501	0.2605	0.2709	0.2778	0.2848 (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					
windows (Uw = 1.20)			3.3000	1.1450	3.7786		(27)					
Half glazed doors			10.3900	1.2000	12.4680		(26a)					
Solid Door			2.0500	1.4000	2.8700		(26)					
External Wall 1	80.0000	15.7400	64.2600	0.1400	8.9964		(29a)					
Corridor	7.6400		7.6400	0.1321	1.0089		(29a)					
External Roof 1	78.5600		78.5600	0.1200	9.4272		(30)					
Total net area of external elements Aum(A, m2)			166.2000				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	38.5491		(33)					
Party Wall 1			16.3100	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (User defined value 0.100 * total exposed area)							16.6200 (36)					
Total fabric heat loss						(33) + (36) =	55.1691 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 23.3505	Feb 23.0793	Mar 22.8081	Apr 21.4521	May 21.1809	Jun 19.8248	Jul 19.8248	Aug 19.5536	Sep 20.3673	Oct 21.1809	Nov 21.7233	Dec 22.2657 (38)
Heat transfer coeff	78.5196	78.2484	77.9772	76.6212	76.3500	74.9939	74.9939	74.7227	75.5363	76.3500	76.8924	77.4348 (39)
Average = Sum(39)m / 12 =												76.5534 (39)
HLP	Jan 0.8948	Feb 0.8917	Mar 0.8886	Apr 0.8732	May 0.8701	Jun 0.8546	Jul 0.8546	Aug 0.8515	Sep 0.8608	Oct 0.8701	Nov 0.8763	Dec 0.8824 (40)
HLP (average)												0.8724 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5937 (42)
Average daily hot water use (litres/day)												95.7993 (43)
Daily hot water use	Jan 105.3792	Feb 101.5472	Mar 97.7153	Apr 93.8833	May 90.0513	Jun 86.2193	Jul 86.2193	Aug 90.0513	Sep 93.8833	Oct 97.7153	Nov 101.5472	Dec 105.3792 (44)
Energy conte	156.2743	136.6785	141.0400	122.9621	117.9850	101.8121	94.3439	108.2610	109.5540	127.6746	139.3668	151.3433 (45)
Energy content (annual)										Total = Sum(45)m =		1507.2956 (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

	23.4411	20.5018	21.1560	18.4443	17.6978	15.2718	14.1516	16.2391	16.4331	19.1512	20.9050	22.7015 (46)
Water storage loss:												
Store volume												180.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0115 (51)
Volume factor from Table 2a												0.8736 (52)
Temperature factor from Table 2b												0.5400 (53)
Enter (49) or (54) in (55)												0.9805 (55)
Total storage loss												
30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965	(56)
If cylinder contains dedicated solar storage												
30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965	(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												
209.9332	185.1446	194.6989	174.8900	171.6439	153.7401	148.0028	161.9199	161.4819	181.3335	191.2948	205.0022	(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												
209.9332	185.1446	194.6989	174.8900	171.6439	153.7401	148.0028	161.9199	161.4819	181.3335	191.2948	205.0022	(64)
Heat gains from water heating, kWh/month												
94.8883	84.2185	89.8229	82.4272	82.1571	75.3949	74.2964	78.9239	77.9691	85.3789	87.8818	93.2488	(65)
Total per year (kWh/year) = Sum(64)m =												2139.0856 (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	129.6827	129.6827	129.6827	129.6827	129.6827	129.6827	129.6827	129.6827	129.6827	129.6827	129.6827	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
28.1275	24.9826	20.3172	15.3814	11.4978	9.7069	10.4887	13.6336	18.2989	23.2347	27.1183	28.9092	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
234.8769	237.3142	231.1723	218.0969	201.5917	186.0790	175.7156	173.2784	179.4202	192.4956	209.0009	224.5135	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
35.9683	35.9683	35.9683	35.9683	35.9683	35.9683	35.9683	35.9683	35.9683	35.9683	35.9683	35.9683	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	(71)
Water heating gains (Table 5)												
127.5381	125.3251	120.7297	114.4823	110.4262	104.7151	99.8608	106.0805	108.2904	114.7566	122.0581	125.3344	(72)
Total internal gains												
455.4472	452.5266	437.1240	412.8654	388.4205	365.4059	350.9699	357.8972	370.9143	395.3917	423.0821	443.6619	(73)

6. Solar gains

[Jan]												
	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	W/m2	Specific data	factor	W						
				or Table 6b	Table 6c	Table 6d						
West	3.3000	19.6403	0.6300	0.7000	0.7700	19.8077	(80)					
Solar gains	19.8077	38.7480	63.8124	93.0666	114.0566	116.7572	111.1576	95.4828	74.2165	45.9777	24.6978	16.2889 (83)
Total gains	475.2549	491.2746	500.9364	505.9320	502.4771	482.1631	462.1276	453.3800	445.1308	441.3694	447.7799	459.9507 (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	77.6080	77.8770	78.1478	79.5309	79.8134	81.2566	81.5515	80.6731	79.8134	79.2504	78.6953	
alpha	6.1739	6.1918	6.2099	6.3021	6.3209	6.4171	6.4171	6.4368	6.3782	6.3209	6.2834	6.2464
util living area	0.9988	0.9982	0.9964	0.9899	0.9643	0.8632	0.6884	0.7228	0.9224	0.9890	0.9975	0.9990 (86)
MIT	20.0610	20.1359	20.2903	20.5195	20.7457	20.9279	20.9866	20.9819	20.8750	20.5968	20.2992	20.0533 (87)
Th 2	20.1719	20.1745	20.1772	20.1904	20.1930	20.2062	20.2062	20.2089	20.2009	20.1930	20.1877	20.1824 (88)
util rest of house	0.9984	0.9976	0.9951	0.9856	0.9469	0.7993	0.5773	0.6157	0.8790	0.9834	0.9966	0.9987 (89)
MIT 2	18.9031	19.0147	19.2423	19.5854	19.9078	20.1482	20.2001	20.1998	20.0858	19.7002	19.2637	18.9000 (90)
Living area fraction									fLA = Living area / (4) =			0.3328 (91)
MIT	19.2884	19.3878	19.5910	19.8963	20.1866	20.4077	20.4619	20.4601	20.3484	19.9985	19.6082	19.2838 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.1384	19.2378	19.4410	19.7463	20.0366	20.2577	20.3119	20.3101	20.1984	19.8485	19.4582	19.1338 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9977	0.9966	0.9935	0.9824	0.9426	0.8041	0.5929	0.6303	0.8788	0.9801	0.9953	0.9981	(94)
Useful gains	474.1440	489.6085	497.6562	497.0210	473.6290	387.6972	273.9848	285.7859	391.1889	432.6003	445.6766	459.0757	(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													
	1165.1075	1121.9074	1009.1046	831.0537	636.5010	424.2897	278.3666	292.1704	460.6533	706.1244	950.2552	1156.3949	(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													
	514.0768	424.9049	380.5176	240.5035	121.1767	0.0000	0.0000	0.0000	0.0000	203.5019	363.2966	518.8055	(98)
Space heating												2766.7835	(98)
Space heating per m2												(98) / (4) =	31.5303 (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

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 %)													89.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3091.3782 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	514.0768	424.9049	380.5176	240.5035	121.1767	0.0000	0.0000	0.0000	0.0000	203.5019	363.2966	518.8055	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	574.3875	474.7540	425.1593	268.7190	135.3930	0.0000	0.0000	0.0000	0.0000	227.3764	405.9180	579.6710	(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	209.9332	185.1446	194.6989	174.8900	171.6439	153.7401	148.0028	161.9199	161.4819	181.3335	191.2948	205.0022	(64)
Efficiency of water heater (217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(216)
Fuel for water heating, kWh/month	234.5622	206.8655	217.5406	195.4078	191.7809	171.7766	165.3662	180.9161	180.4267	202.6072	213.7372	229.0527	(219)
Water heating fuel used												2390.0398	(219)
Annual totals kWh/year													
Space heating fuel - main system												3091.3782	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)													216.7864 (230a)
central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													246.7864 (231)
Electricity for lighting (calculated in Appendix L)													496.7399 (232)
Total delivered energy for all uses													6224.9443 (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	3091.3782	0.2160	667.7377	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2390.0398	0.2160	516.2486	(264)
Space and water heating			1183.9863	(265)
Pumps and fans	246.7864	0.5190	128.0821	(267)
Energy for lighting	496.7399	0.5190	257.8080	(268)
Total CO2, kg/year			1569.8764	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			17.8900	(273)

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

DER			17.8900	ZC1
Total Floor Area		TFA	87.7500	
Assumed number of occupants		N	2.5937	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			15.8613	ZC2
CO2 emissions from cooking, equation (L16)			2.0655	ZC3
Total CO2 emissions			35.8168	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			35.8168	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	87.7500 (1b)	x 2.7000 (2b)	= 236.9250 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	87.7500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 236.9250 (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) =	0.1266 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3766 (18)
					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3484 (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	0.4442	0.4355	0.4268	0.3832	0.3745	0.3310	0.3310	0.3222	0.3484	0.3745	0.3919	0.4093 (22b)
Effective ac	0.5986	0.5948	0.5911	0.5734	0.5701	0.5548	0.5548	0.5519	0.5607	0.5701	0.5768	0.5838 (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			2.0500	1.0000	2.0500			(26)					
TER Semi-glazed door			10.3900	1.2000	12.4680			(26a)					
TER Opening Type (Uw = 1.40)			3.3000	1.3258	4.3750			(27)					
External Wall 1	80.0000	15.7400	64.2600	0.1800	11.5668			(29a)					
Corridor	7.6400		7.6400	0.1800	1.3752			(29a)					
External Roof 1	78.5600		78.5600	0.1300	10.2128			(30)					
Total net area of external elements Aum(A, m2)			166.2000					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	42.0478			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								4.7836 (36)					
Total fabric heat loss						(33) + (36) =	46.8314	(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	46.8054	46.5059	46.2123	44.8335	44.5755	43.3745	43.3745	43.1521	43.8371	44.5755	45.0974	45.6430	(38)
Heat transfer coeff	93.6368	93.3373	93.0437	91.6649	91.4069	90.2059	90.2059	89.9835	90.6685	91.4069	91.9288	92.4744	(39)
Average = Sum(39)m / 12 =												91.6636	(39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0671	1.0637	1.0603	1.0446	1.0417	1.0280	1.0280	1.0255	1.0333	1.0417	1.0476	1.0538	(40)
HLP (average)												1.0446	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5937 (42)
Average daily hot water use (litres/day)												95.7993 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	105.3792	101.5472	97.7153	93.8833	90.0513	86.2193	86.2193	90.0513	93.8833	97.7153	101.5472	105.3792 (44)
Energy conte	156.2743	136.6785	141.0400	122.9621	117.9850	101.8121	94.3439	108.2610	109.5540	127.6746	139.3668	151.3433 (45)
Energy content (annual)											Total = Sum(45)m =	1507.2956 (45)
Distribution loss	(46)m = 0.15 x (45)m											
	23.4411	20.5018	21.1560	18.4443	17.6978	15.2718	14.1516	16.2391	16.4331	19.1512	20.9050	22.7015 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (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)												0.8381 (55)
Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (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	205.5170	181.1558	190.2826	170.6163	167.2277	149.4663	143.5866	157.5037	157.2082	176.9173	187.0210	200.5860 (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	205.5170	181.1558	190.2826	170.6163	167.2277	149.4663	143.5866	157.5037	157.2082	176.9173	187.0210	200.5860 (64)
Heat gains from water heating, kWh/month	91.3553	81.0274	86.2899	79.0082	78.6242	71.9759	70.7635	75.3909	74.5501	81.8459	84.4628	89.7158 (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	129.6827	129.6827	129.6827	129.6827	129.6827	129.6827	129.6827	129.6827	129.6827	129.6827	129.6827	129.6827	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.1275	24.9826	20.3172	15.3814	11.4978	9.7069	10.4887	13.6336	18.2989	23.2347	27.1183	28.9092	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	234.8769	237.3142	231.1723	218.0969	201.5917	186.0790	175.7156	173.2784	179.4202	192.4956	209.0009	224.5135	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.9683	35.9683	35.9683	35.9683	35.9683	35.9683	35.9683	35.9683	35.9683	35.9683	35.9683	35.9683	(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)	-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	-103.7461	(71)
Water heating gains (Table 5)	122.7894	120.5765	115.9811	109.7337	105.6776	99.9665	95.1122	101.3319	103.5417	110.0080	117.3095	120.5857	(72)
Total internal gains	450.6986	447.7780	432.3754	408.1168	383.6719	360.6573	346.2213	353.1486	366.1657	390.6431	418.3335	438.9133	(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			3.3000	19.6403	0.6300	0.7000	0.7700	19.8077 (80)				

Solar gains	19.8077	38.7480	63.8124	93.0666	114.0566	116.7572	111.1576	95.4828	74.2165	45.9777	24.6978	16.2889 (83)
Total gains	470.5062	486.5260	496.1878	501.1834	497.7285	477.4145	457.3789	448.6314	440.3822	436.6208	443.0313	455.2021 (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	65.0786	65.2874	65.4934	66.4786	66.6662	67.5538	67.5538	67.7207	67.2091	66.6662	66.2877	65.8966
alpha	5.3386	5.3525	5.3662	5.4319	5.4444	5.5036	5.5036	5.5147	5.4806	5.4444	5.4192	5.3931
util living area	0.9989	0.9984	0.9970	0.9926	0.9768	0.9143	0.7805	0.8105	0.9518	0.9921	0.9979	0.9991 (86)
MIT	19.8114	19.8942	20.0704	20.3326	20.6027	20.8458	20.9563	20.9449	20.7742	20.4350	20.0886	19.8030 (87)
Th 2	20.0278	20.0306	20.0334	20.0463	20.0487	20.0601	20.0601	20.0622	20.0557	20.0487	20.0438	20.0387 (88)
util rest of house	0.9985	0.9978	0.9959	0.9893	0.9637	0.8591	0.6535	0.6935	0.9177	0.9878	0.9970	0.9987 (89)
MIT 2	18.4316	18.5546	18.8142	19.2058	19.5955	19.9280	20.0389	20.0326	19.8381	19.3573	18.8487	18.4272 (90)
Living area fraction	18.8907	19.0004	19.2322	19.5807	19.9306	20.2334	20.3442	20.3362	20.1496	19.7159	19.2613	18.8850 (91)
MIT	18.8907	19.0004	19.2322	19.5807	19.9306	20.2334	20.3442	20.3362	20.1496	19.7159	19.2613	18.8850 (92)
Temperature adjustment	18.8907	19.0004	19.2322	19.5807	19.9306	20.2334	20.3442	20.3362	20.1496	19.7159	19.2613	18.8850 (93)
adjusted MIT	18.8907	19.0004	19.2322	19.5807	19.9306	20.2334	20.3442	20.3362	20.1496	19.7159	19.2613	18.8850 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9978	0.9969	0.9945	0.9870	0.9616	0.8714	0.6962	0.7320	0.9220	0.9857	0.9960	0.9982	(94)
Useful gains	469.4635	485.0325	493.4744	494.6558	478.6285	416.0063	318.4052	328.4159	406.0468	430.3633	441.2534	454.3680	(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	1366.2289	1316.0894	1184.6519	979.0463	752.3371	508.1689	337.7480	354.1923	548.5116	833.2597	1117.9723	1357.9870	(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	667.1935	558.4702	514.2360	348.7612	203.6392	0.0000	0.0000	0.0000	0.0000	299.7549	487.2376	672.2925	(98)
Space heating												3751.5852	(98)
Space heating per m2												42.7531	(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													4012.3906 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	667.1935	558.4702	514.2360	348.7612	203.6392	0.0000	0.0000	0.0000	0.0000	299.7549	487.2376	672.2925	(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)	713.5759	597.2944	549.9851	373.0066	217.7959	0.0000	0.0000	0.0000	0.0000	320.5935	521.1098	719.0294	(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	205.5170	181.1558	190.2826	170.6163	167.2277	149.4663	143.5866	157.5037	157.2082	176.9173	187.0210	200.5860	(64)
Efficiency of water heater (217)m	87.7298	87.6224	87.3371	86.6819	85.3403	79.8000	79.8000	79.8000	79.8000	86.2097	87.2549	79.8000	(216)
Fuel for water heating, kWh/month	234.2612	206.7460	217.8715	196.8303	195.9540	187.3011	179.9330	197.3730	197.0027	205.2173	214.3388	228.4713	(219)
Water heating fuel used													2461.3004 (219)
Annual totals kWh/year													
Space heating fuel - main system													4012.3906 (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)													496.7399 (232)
Total delivered energy for all uses													7045.4309 (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	4012.3906	0.2160	866.6764 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2461.3004	0.2160	531.6409 (264)
Space and water heating			1398.3173 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	496.7399	0.5190	257.8080 (268)
Total CO2, kg/m2/year			1695.0503 (272)
Emissions per m2 for space and water heating			15.9352 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.9380 (272b)
Emissions per m2 for pumps and fans			0.4436 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.9352 * 1.00) + 2.9380 + 0.4436, rounded to 2 d.p.			19.3200 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 5			Issued on Date	13/04/2022
Assessment Reference	Unit 5_Be Green	Prop Type Ref	160 Malden Road		
Property	160, Malden Road				
SAP Rating	91 B	DER	13.06	TER	27.48
Environmental	92 A	% DER<TER	52.47		
CO ₂ Emissions (t/year)	0.54	DFEE	34.61	TFEE	41.46
General Requirements Compliance	Pass	% DFEE<TFEE	16.52		
Assessor Details	Mr. Andy Love, Love Design Studio Ltd, Tel: 07563755762, Mail@lovedesignstudio.co.uk			Assessor ID	U860-0001
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 53 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

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 27.48 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.06 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)41.5 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)34.6 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.23 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified ψ -value of 0.100

3 Air permeability

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

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric

Air-to-water heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 1.82 kWh/day	
Permitted by DBSCG 2.10	OK	
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
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Hot water controls:

Cylinderstat	OK
Independent timer for DHW	OK

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:	0.53
Maximum	1.5 OK
MVHR efficiency:	90%
Minimum:	70% OK

9 Summertime temperature

Overheating risk (Thames Valley):	Medium	OK
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Based on:

Overshading:	Average
Windows facing West:	2.02 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

External wall U-value	0.14 W/m ² K
External wall U-value	0.14 W/m ² K
Party wall U-value	0.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	0.68 kW

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	53.2600 (1b)	x 2.7000 (2b)	= 143.8020 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 143.8020 (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
windows (Uw = 1.20)			2.0200	1.1450	2.3130		(27)
Half glazed doors			8.3400	1.2000	10.0080		(26a)
Solid Door			2.0500	1.4000	2.8700		(26)
External Wall 1	25.4800	12.4100	13.0700	0.1400	1.8298		(29a)
Corridor	3.5900		3.5900	0.1321	0.4741		(29a)
Total net area of external elements Aum(A, m ²)			29.0700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	17.4948			(33)
Party Wall 1			54.4800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (User defined value 0.100 * total exposed area)							2.9070 (36)
Total fabric heat loss							(33) + (36) = 20.4018 (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	12.6096	12.4717	12.3338	11.6442	11.5063	10.8167	10.8167	10.6788	11.0925	11.5063	11.7821	12.0579 (38)
Heat transfer coeff	33.0114	32.8735	32.7356	32.0460	31.9081	31.2185	31.2185	31.0806	31.4944	31.9081	32.1839	32.4598 (39)
Average = Sum(39)m / 12 =												32.0115 (39)
HLP	0.6198	0.6172	0.6146	0.6017	0.5991	0.5862	0.5862	0.5836	0.5913	0.5991	0.6043	0.6095 (40)
HLP (average)												0.6010 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7862 (42)
Average daily hot water use (litres/day)												76.6228 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	84.2851	81.2201	78.1552	75.0903	72.0254	68.9605	68.9605	72.0254	75.0903	78.1552	81.2201	84.2851 (44)
Energy conte	124.9923	109.3191	112.8075	98.3483	94.3675	81.4320	75.4587	86.5900	87.6241	102.1175	111.4692	121.0484 (45)
Energy content (annual)												Total = Sum(45)m = 1205.5747 (45)
Distribution loss (46)m = 0.15 x (45)m	18.7488	16.3979	16.9211	14.7522	14.1551	12.2148	11.3188	12.9885	13.1436	15.3176	16.7204	18.1573 (46)

Water storage loss:													
Store volume												180.0000 (47)	
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0115 (51)	
Volume factor from Table 2a												0.8736 (52)	
Temperature factor from Table 2b												0.5400 (53)	
Enter (49) or (54) in (55)												0.9805 (55)	
Total storage loss													
	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965	(56)
If cylinder contains dedicated solar storage													
	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965	(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													
	178.6512	157.7852	166.4664	150.2762	148.0264	133.3600	129.1176	140.2489	139.5521	155.7764	163.3972	174.7073	(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													
	178.6512	157.7852	166.4664	150.2762	148.0264	133.3600	129.1176	140.2489	139.5521	155.7764	163.3972	174.7073	(64)
								Total per year (kWh/year) = Sum (64)m =			1837.3647	(64)	
Heat gains from water heating, kWh/month													
	84.4870	75.1215	80.4356	74.2432	74.3043	68.6185	68.0171	71.7183	70.6774	76.8812	78.6059	83.1757	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	89.3111	89.3111	89.3111	89.3111	89.3111	89.3111	89.3111	89.3111	89.3111	89.3111	89.3111	89.3111 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.6286	16.5457	13.4559	10.1870	7.6149	6.4288	6.9466	9.0294	12.1192	15.3881	17.9602	19.1463 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	155.6910	157.3065	153.2353	144.5682	133.6274	123.3447	116.4752	114.8596	118.9309	127.5980	138.5387	148.8215 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.9311	31.9311	31.9311	31.9311	31.9311	31.9311	31.9311	31.9311	31.9311	31.9311	31.9311	31.9311 (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)	-71.4489	-71.4489	-71.4489	-71.4489	-71.4489	-71.4489	-71.4489	-71.4489	-71.4489	-71.4489	-71.4489	-71.4489 (71)
Water heating gains (Table 5)	113.5579	111.7879	108.1124	103.1155	99.8714	95.3035	91.4209	96.3955	98.1630	103.3349	109.1748	111.7953 (72)
Total internal gains	340.6707	338.4335	327.5969	310.6640	293.9071	277.8703	267.6360	273.0779	282.0065	299.1144	318.4671	332.5564 (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			
West				2.0200	19.6403	0.6300		0.7000	0.7700		12.1247 (80)	
Solar gains	12.1247	23.7185	39.0609	56.9680	69.8165	71.4696	68.0419	58.4470	45.4295	28.1439	15.1181	9.9708 (83)
Total gains	352.7954	362.1519	366.6578	367.6320	363.7235	349.3399	335.6779	331.5249	327.4359	327.2583	333.5852	342.5271 (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	112.0403	112.5104	112.9844	115.4156	115.9145	118.4748	118.4748	119.0006	117.4372	115.9145	114.9210	113.9445
alpha	8.4694	8.5007	8.5323	8.6944	8.7276	8.8983	8.8983	8.9334	8.8291	8.7276	8.6614	8.5963
util living area	0.9917	0.9871	0.9725	0.9191	0.7863	0.5702	0.4091	0.4311	0.6576	0.9033	0.9787	0.9931 (86)
MIT	20.6068	20.6645	20.7693	20.9023	20.9790	20.9988	20.9999	20.9999	20.9961	20.9290	20.7633	20.5987 (87)
Th 2	20.4122	20.4145	20.4168	20.4285	20.4308	20.4425	20.4425	20.4448	20.4378	20.4308	20.4261	20.4215 (88)
util rest of house	0.9894	0.9836	0.9650	0.8990	0.7470	0.5213	0.3573	0.3792	0.6066	0.8772	0.9724	0.9912 (89)
MIT 2	19.8895	19.9746	20.1256	20.3168	20.4111	20.4417	20.4425	20.4448	20.4350	20.3544	20.1264	19.8857 (90)
Living area fraction												0.5315 (91)
MIT	20.2708	20.3413	20.4678	20.6280	20.7129	20.7378	20.7388	20.7399	20.7332	20.6598	20.4650	20.2647 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2708	20.3413	20.4678	20.6280	20.7129	20.7378	20.7388	20.7399	20.7332	20.6598	20.4650	20.2647 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9887	0.9831	0.9657	0.9065	0.7669	0.5473	0.3849	0.4068	0.6336	0.8883	0.9728	0.9906 (94)
Useful gains	348.8208	356.0216	354.0831	333.2441	278.9565	191.2001	129.1905	134.8594	207.4611	290.7071	324.5260	339.2994 (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	527.2188	507.6105	457.2428	375.8361	287.5857	191.6144	129.2068	134.8854	208.9090	320.9901	430.1373	521.4562 (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	132.7281	101.8678	76.7508	30.6662	6.4201	0.0000	0.0000	0.0000	0.0000	22.5306	76.0401	135.5247 (98)
Space heating												582.5284 (98)
Space heating per m2												10.9374 (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

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 %)													175.1000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													332.6832 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	132.7281	101.8678	76.7508	30.6662	6.4201	0.0000	0.0000	0.0000	0.0000	22.5306	76.0401	135.5247	(98)
Space heating efficiency (main heating system 1)	175.1000	175.1000	175.1000	175.1000	175.1000	0.0000	0.0000	0.0000	0.0000	175.1000	175.1000	175.1000	(210)
Space heating fuel (main heating system)	75.8013	58.1769	43.8326	17.5135	3.6665	0.0000	0.0000	0.0000	0.0000	12.8672	43.4267	77.3984	(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	178.6512	157.7852	166.4664	150.2762	148.0264	133.3600	129.1176	140.2489	139.5521	155.7764	163.3972	174.7073	(64)
Efficiency of water heater	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)
Fuel for water heating, kWh/month	102.0281	90.1115	95.0693	85.8231	84.5382	76.1622	73.7394	80.0964	79.6985	88.9642	93.3165	99.7757	(219)
Water heating fuel used												1049.3231	(219)
Annual totals kWh/year													
Space heating fuel - main system												332.6832	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6625)													
mechanical ventilation fans (SFP = 0.6625)													116.2280 (230a)
central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													146.2280 (231)
Electricity for lighting (calculated in Appendix L)													328.9864 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.68 * 951 * 1.00) =										-517.1351			-517.1351 (233)
Total delivered energy for all uses													1340.0856 (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	332.6832	0.5190	172.6626 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1049.3231	0.5190	544.5987 (264)
Space and water heating			717.2613 (265)
Pumps and fans	146.2280	0.5190	75.8923 (267)
Energy for lighting	328.9864	0.5190	170.7439 (268)
Energy saving/generation technologies			
PV Unit	-517.1351	0.5190	-268.3931 (269)
Total CO2, kg/year			695.5044 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.0600 (273)

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

DER			13.0600 ZC1
Total Floor Area		TFA	53.2600
Assumed number of occupants		N	1.7862
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			17.3224 ZC2
CO2 emissions from cooking, equation (L16)			3.0392 ZC3
Total CO2 emissions			33.4216 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			33.4216 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	53.2600 (1b)	x 2.7000 (2b)	= 143.8020 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 143.8020 (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				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) =	0.1391 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3891 (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) =		0.3015 (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	0.3845	0.3769	0.3694	0.3317	0.3242	0.2865	0.2865	0.2789	0.3015	0.3242	0.3392	0.3543 (22b)
	0.5739	0.5710	0.5682	0.5550	0.5525	0.5410	0.5410	0.5389	0.5455	0.5525	0.5575	0.5628 (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			2.0500	1.0000	2.0500		(26)
TER Semi-glazed door			8.3400	1.2000	10.0080		(26a)
TER Opening Type (Uw = 1.40)			2.0200	1.3258	2.6780		(27)
External Wall 1	25.4800	12.4100	13.0700	0.1800	2.3526		(29a)
Corridor	3.5900		3.5900	0.1800	0.6462		(29a)
Total net area of external elements Aum(A, m ²)			29.0700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	17.7348		(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)							2.5168 (36)
Total fabric heat loss						(33) + (36) =	20.2516 (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	27.2345	27.0983	26.9648	26.3378	26.2205	25.6744	25.6744	25.5733	25.8847	26.2205	26.4578	26.7059 (38)
Heat transfer coeff	47.4861	47.3499	47.2164	46.5894	46.4721	45.9260	45.9260	45.8249	46.1364	46.4721	46.7094	46.9575 (39)
Average = Sum(39)m / 12 =												46.5889 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8916	0.8890	0.8865	0.8748	0.8726	0.8623	0.8623	0.8604	0.8662	0.8726	0.8770	0.8817 (40)
HLP (average)												0.8747 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7862 (42)
Average daily hot water use (litres/day)												76.6228 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	84.2851	81.2201	78.1552	75.0903	72.0254	68.9605	68.9605	72.0254	75.0903	78.1552	81.2201	84.2851 (44)
Energy content (annual)	124.9923	109.3191	112.8075	98.3483	94.3675	81.4320	75.4587	86.5900	87.6241	102.1175	111.4692	121.0484 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1205.5747 (45)
	18.7488	16.3979	16.9211	14.7522	14.1551	12.2148	11.3188	12.9885	13.1436	15.3176	16.7204	18.1573 (46)
Water storage loss:												180.0000 (47)
Store volume												1.5520 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.8381 (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	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (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	174.2350	153.7963	162.0502	146.0025	143.6102	129.0862	124.7014	135.8327	135.2783	151.3602	159.1234	170.2910 (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	174.2350	153.7963	162.0502	146.0025	143.6102	129.0862	124.7014	135.8327	135.2783	151.3602	159.1234	170.2910 (64)
Heat gains from water heating, kWh/month	80.9541	71.9304	76.9026	70.8242	70.7713	65.1995	64.4842	68.1853	67.2584	73.3482	75.1869	79.6427 (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	89.3111	89.3111	89.3111	89.3111	89.3111	89.3111	89.3111	89.3111	89.3111	89.3111	89.3111	89.3111 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.6286	16.5457	13.4559	10.1870	7.6149	6.4288	6.9466	9.0294	12.1192	15.3881	17.9602	19.1463 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	155.6910	157.3065	153.2353	144.5682	133.6274	123.3447	116.4752	114.8596	118.9309	127.5980	138.5387	148.8215 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.9311	31.9311	31.9311	31.9311	31.9311	31.9311	31.9311	31.9311	31.9311	31.9311	31.9311	31.9311 (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)	-71.4489	-71.4489	-71.4489	-71.4489	-71.4489	-71.4489	-71.4489	-71.4489	-71.4489	-71.4489	-71.4489	-71.4489 (71)
Water heating gains (Table 5)	108.8092	107.0393	103.3637	98.3669	95.1228	90.5549	86.6723	91.6469	93.4144	98.5863	104.4262	107.0467 (72)
Total internal gains	335.9221	333.6849	322.8483	305.9154	289.1584	273.1217	262.8874	268.3293	277.2578	294.3658	313.7185	327.8078 (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				2.0200	19.6403	0.6300	0.7000			0.7700			12.1247 (80)
-----								-----					
Solar gains	12.1247	23.7185	39.0609	56.9680	69.8165	71.4696	68.0419	58.4470	45.4295	28.1439	15.1181	9.9708	(83)
Total gains	348.0468	357.4033	361.9092	362.8834	358.9749	344.5913	330.9293	326.7763	322.6873	322.5097	328.8366	337.7785	(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	77.8883	78.1123	78.3332	79.3874	79.5878	80.5341	80.5341	80.7118	80.1669	79.5878	79.1834	78.7650
alpha	6.1926	6.2075	6.2222	6.2925	6.3059	6.3689	6.3689	6.3808	6.3445	6.3059	6.2789	6.2510
util living area	0.9966	0.9952	0.9910	0.9768	0.9292	0.7870	0.6001	0.6305	0.8579	0.9726	0.9931	0.9971 (86)
MIT	20.1744	20.2471	20.3962	20.6115	20.8168	20.9577	20.9935	20.9912	20.9228	20.6850	20.4012	20.1619 (87)
Th 2	20.1747	20.1768	20.1790	20.1890	20.1909	20.1997	20.1997	20.2013	20.1963	20.1909	20.1871	20.1831 (88)
util rest of house	0.9955	0.9936	0.9878	0.9678	0.9004	0.7131	0.4965	0.5285	0.7980	0.9603	0.9905	0.9962 (89)
MIT 2	19.0706	19.1783	19.3967	19.7139	19.9967	20.1685	20.1969	20.1972	20.1316	19.8210	19.4109	19.0589 (90)
Living area fraction	19.6573	19.7464	19.9280	20.1910	20.4327	20.5880	20.6203	20.6192	20.5522	20.2802	19.9373	19.6452 (92)
Temperature adjustment	19.6573	19.7464	19.9280	20.1910	20.4327	20.5880	20.6203	20.6192	20.5522	20.2802	19.9373	19.6452 (93)
adjusted MIT	19.6573	19.7464	19.9280	20.1910	20.4327	20.5880	20.6203	20.6192	20.5522	20.2802	19.9373	19.6452 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9946	0.9926	0.9867	0.9679	0.9100	0.7508	0.5519	0.5830	0.8266	0.9619	0.9895	0.9955 (94)
Ext temp.	346.1730	354.7461	357.0814	351.2248	326.6708	258.7112	182.6258	190.5139	266.7449	310.2349	325.3764	336.2523 (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	729.2596	702.9774	634.0201	526.0419	405.8246	275.0038	184.6384	193.3465	297.6790	449.8602	599.6221	725.2672 (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	285.0165	234.0114	206.0424	125.8683	58.8905	0.0000	0.0000	0.0000	0.0000	103.8812	197.4569	289.4270 (98)
Space heating per m ²												1500.5943 (98)
										(98) / (4) =		28.1749 (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													1604.9137 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	285.0165	234.0114	206.0424	125.8683	58.8905	0.0000	0.0000	0.0000	0.0000	103.8812	197.4569	289.4270	(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)	304.8305	250.2796	220.3662	134.6185	62.9844	0.0000	0.0000	0.0000	0.0000	111.1029	211.1839	309.5476	(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	174.2350	153.7963	162.0502	146.0025	143.6102	129.0862	124.7014	135.8327	135.2783	151.3602	159.1234	170.2910	(64)
Efficiency of water heater (217)m	86.1191	85.9306	85.4556	84.4210	82.6415	79.8000	79.8000	79.8000	79.8000	83.8341	85.3906	86.2177	(216)
Fuel for water heating, kWh/month	202.3187	178.9773	189.6309	172.9456	173.7749	161.7622	156.2674	170.2164	169.5217	180.5474	186.3477	197.5129	(219)
Water heating fuel used												2139.8230	(219)
Annual totals kWh/year													
Space heating fuel - main system												1604.9137	(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)												328.9864	(232)
Total delivered energy for all uses												4148.7230	(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	1604.9137	0.2160	346.6614 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2139.8230	0.2160	462.2018 (264)
Space and water heating			808.8631 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	328.9864	0.5190	170.7439 (268)
Total CO2, kg/m2/year			1018.5320 (272)
Emissions per m2 for space and water heating			15.1871 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			3.2059 (272b)
Emissions per m2 for pumps and fans			0.7308 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.1871 * 1.55) + 3.2059 + 0.7308, rounded to 2 d.p.			27.4800 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 5			Issued on Date	13/04/2022
Assessment Reference	Unit 5_Be Lean	Prop Type Ref	160 Malden Road		
Property	160, Malden Road				
SAP Rating	84 B	DER	15.50	TER	19.12
Environmental	90 B	% DER<TER	18.95		
CO ₂ Emissions (t/year)	0.72	DFEE	34.61	TFEE	41.46
General Requirements Compliance	Pass	% DFEE<TFEE	16.52		
Assessor Details	Mr. Andy Love, Love Design Studio Ltd, Tel: 07563755762, Mail@lovedesignstudio.co.uk			Assessor ID	9990-1318
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 53 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
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 19.12 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.50 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)41.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)34.6 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.23 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.100

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
x x

Efficiency: 90%	
Minimum: 88%	OK

Secondary heating system:	None
---------------------------	------

5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 1.82 kWh/day	
Permitted by DBSCG 2.10	OK	
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
-------------------------	-----------------------------------	----

Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK

Boiler interlock	Yes	OK
------------------	-----	----

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:	0.53	
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 West:	2.02 m ² , No overhang	
Air change rate:	2.00 ach	
Blinds/curtains:	None	

10 Key features

External wall U-value	0.14 W/m ² K
External wall U-value	0.14 W/m ² K
Party wall U-value	0.00 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	53.2600 (1b)	x 2.7000 (2b)	= 143.8020 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 143.8020 (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
windows (Uw = 1.20)			2.0200	1.1450	2.3130		(27)
Half glazed doors			8.3400	1.2000	10.0080		(26a)
Solid Door			2.0500	1.4000	2.8700		(26)
External Wall 1	25.4800	12.4100	13.0700	0.1400	1.8298		(29a)
Corridor	3.5900		3.5900	0.1321	0.4741		(29a)
Total net area of external elements Aum(A, m ²)			29.0700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	17.4948			(33)
Party Wall 1			54.4800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (User defined value 0.100 * total exposed area)							2.9070 (36)
Total fabric heat loss							(33) + (36) = 20.4018 (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	12.6096	12.4717	12.3338	11.6442	11.5063	10.8167	10.8167	10.6788	11.0925	11.5063	11.7821	12.0579 (38)
Average = Sum(39)m / 12 =	33.0114	32.8735	32.7356	32.0460	31.9081	31.2185	31.2185	31.0806	31.4944	31.9081	32.1839	32.4598 (39)
												32.0115 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.6198	0.6172	0.6146	0.6017	0.5991	0.5862	0.5862	0.5836	0.5913	0.5991	0.6043	0.6095 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7862 (42)
Average daily hot water use (litres/day)												76.6228 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	84.2851	81.2201	78.1552	75.0903	72.0254	68.9605	68.9605	72.0254	75.0903	78.1552	81.2201	84.2851 (44)
Energy content (annual)	124.9923	109.3191	112.8075	98.3483	94.3675	81.4320	75.4587	86.5900	87.6241	102.1175	111.4692	121.0484 (45)
Distribution loss (46)m = 0.15 x (45)m	18.7488	16.3979	16.9211	14.7522	14.1551	12.2148	11.3188	12.9885	13.1436	15.3176	16.7204	18.1573 (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												180.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0115 (51)
Volume factor from Table 2a												0.8736 (52)
Temperature factor from Table 2b												0.5400 (53)
Enter (49) or (54) in (55)												0.9805 (55)
Total storage loss												
30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965	(56)
If cylinder contains dedicated solar storage												
30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965	(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												
178.6512	157.7852	166.4664	150.2762	148.0264	133.3600	129.1176	140.2489	139.5521	155.7764	163.3972	174.7073	(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												
178.6512	157.7852	166.4664	150.2762	148.0264	133.3600	129.1176	140.2489	139.5521	155.7764	163.3972	174.7073	(64)
Total per year (kWh/year) = Sum(64)m =												1837.3647 (64)
Heat gains from water heating, kWh/month												
84.4870	75.1215	80.4356	74.2432	74.3043	68.6185	68.0171	71.7183	70.6774	76.8812	78.6059	83.1757	(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	89.3111	89.3111	89.3111	89.3111	89.3111	89.3111	89.3111	89.3111	89.3111	89.3111	89.3111	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
18.6286	16.5457	13.4559	10.1870	7.6149	6.4288	6.9466	9.0294	12.1192	15.3881	17.9602	19.1463	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
155.6910	157.3065	153.2353	144.5682	133.6274	123.3447	116.4752	114.8596	118.9309	127.5980	138.5387	148.8215	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
31.9311	31.9311	31.9311	31.9311	31.9311	31.9311	31.9311	31.9311	31.9311	31.9311	31.9311	31.9311	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-71.4489	-71.4489	-71.4489	-71.4489	-71.4489	-71.4489	-71.4489	-71.4489	-71.4489	-71.4489	-71.4489	-71.4489	(71)
Water heating gains (Table 5)												
113.5579	111.7879	108.1124	103.1155	99.8714	95.3035	91.4209	96.3955	98.1630	103.3349	109.1748	111.7953	(72)
Total internal gains	340.6707	338.4335	327.5969	310.6640	293.9071	277.8703	267.6360	273.0779	282.0065	299.1144	318.4671	332.5564 (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					2.0200	19.6403	0.6300	0.7000			0.7700			12.1247 (80)
Solar gains	12.1247	23.7185	39.0609	56.9680	69.8165	71.4696	68.0419	58.4470	45.4295	28.1439	15.1181			9.9708 (83)
Total gains	352.7954	362.1519	366.6578	367.6320	363.7235	349.3399	335.6779	331.5249	327.4359	327.2583	333.5852			342.5271 (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	112.0403	112.5104	112.9844	115.4156	115.9145	118.4748	118.4748	119.0006	117.4372	115.9145	114.9210	113.9445
alpha	8.4694	8.5007	8.5323	8.6944	8.7276	8.8983	8.8983	8.9334	8.8291	8.7276	8.6614	8.5963
util living area	0.9917	0.9871	0.9725	0.9191	0.7863	0.5702	0.4091	0.4311	0.6576	0.9033	0.9787	0.9931 (86)
MIT	20.6068	20.6645	20.7693	20.9023	20.9790	20.9988	20.9999	20.9999	20.9961	20.9290	20.7633	20.5987 (87)
Th 2	20.4122	20.4145	20.4168	20.4285	20.4308	20.4425	20.4425	20.4448	20.4378	20.4308	20.4261	20.4215 (88)
util rest of house	0.9894	0.9836	0.9650	0.8990	0.7470	0.5213	0.3573	0.3792	0.6066	0.8772	0.9724	0.9912 (89)
MIT 2	19.8895	19.9746	20.1256	20.3168	20.4111	20.4417	20.4425	20.4448	20.4350	20.3544	20.1264	19.8857 (90)
Living area fraction									fLA = Living area / (4) =			0.5315 (91)
MIT	20.2708	20.3413	20.4678	20.6280	20.7129	20.7378	20.7388	20.7399	20.7332	20.6598	20.4650	20.2647 (92)
Temperature adjustment												-0.1500
adjusted MIT	20.1208	20.1913	20.3178	20.4780	20.5629	20.5878	20.5888	20.5899	20.5832	20.5098	20.3150	20.1147 (93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9880	0.9820	0.9635	0.9009	0.7565	0.5341	0.3709	0.3927	0.6199	0.8811	0.9709	0.9900 (94)
Useful gains	348.5637	355.6271	353.2741	331.2082	275.1401	186.5978	124.5125	130.2046	202.9853	288.3531	323.8825	339.0856 (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	522.2671	502.6795	452.3325	371.0292	282.7994	186.9316	124.5240	130.2233	204.1849	316.2039	425.3097	516.5872 (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	129.2354	98.8192	73.6994	28.6711	5.6986	0.0000	0.0000	0.0000	0.0000	20.7210	73.0275	132.0612 (98)
Space heating												561.9334 (98)
Space heating per m2										(98) / (4) =		10.5508 (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

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 %)	89.5000 (206)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Space heating requirement	627.8586 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	129.2354	98.8192	73.6994	28.6711	5.6986	0.0000	0.0000	0.0000	0.0000	20.7210	73.0275	132.0612 (98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000 (210)
Space heating fuel (main heating system)	144.3971	110.4125	82.3457	32.0347	6.3671	0.0000	0.0000	0.0000	0.0000	23.1520	81.5950	147.5544 (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	178.6512	157.7852	166.4664	150.2762	148.0264	133.3600	129.1176	140.2489	139.5521	155.7764	163.3972	174.7073 (64)
Efficiency of water heater (217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000 (216)
Fuel for water heating, kWh/month	199.6103	176.2963	185.9959	167.9064	165.3926	149.0055	144.2655	156.7027	155.9241	174.0518	182.5667	195.2036 (219)
Water heating fuel used	2052.9215 (219)											
Annual totals kWh/year	2052.9215 (219)											
Space heating fuel - main system	627.8586 (211)											
Space heating fuel - secondary	0.0000 (215)											
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6625)												
mechanical ventilation fans (SFP = 0.6625)	116.2280 (230a)											
central heating pump	30.0000 (230c)											
Total electricity for the above, kWh/year	146.2280 (231)											
Electricity for lighting (calculated in Appendix L)	328.9864 (232)											
Total delivered energy for all uses	3155.9944 (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	627.8586	0.2160	135.6175 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2052.9215	0.2160	443.4310 (264)
Space and water heating			579.0485 (265)
Pumps and fans	146.2280	0.5190	75.8923 (267)
Energy for lighting	328.9864	0.5190	170.7439 (268)
Total CO2, kg/year			825.6847 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			15.5000 (273)

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

DER		15.5000 ZC1
Total Floor Area	TFA	53.2600
Assumed number of occupants	N	1.7862
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		17.3224 ZC2
CO2 emissions from cooking, equation (L16)		3.0392 ZC3
Total CO2 emissions		35.8616 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		35.8616 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	53.2600 (1b)	x 2.7000 (2b)	= 143.8020 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 143.8020 (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) = 0.1391 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3891 (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) = 0.3015 (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	0.3845	0.3769	0.3694	0.3317	0.3242	0.2865	0.2865	0.2789	0.3015	0.3242	0.3392	0.3543 (22b)
Effective ac	0.5739	0.5710	0.5682	0.5550	0.5525	0.5410	0.5410	0.5389	0.5455	0.5525	0.5575	0.5628 (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			2.0500	1.0000	2.0500		(26)
TER Semi-glazed door			8.3400	1.2000	10.0080		(26a)
TER Opening Type (Uw = 1.40)			2.0200	1.3258	2.6780		(27)
External Wall 1	25.4800	12.4100	13.0700	0.1800	2.3526		(29a)
Corridor	3.5900		3.5900	0.1800	0.6462		(29a)
Total net area of external elements Aum(A, m ²)			29.0700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	17.7348		(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)							2.5168 (36)
Total fabric heat loss							(33) + (36) = 20.2516 (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	27.2345	27.0983	26.9648	26.3378	26.2205	25.6744	25.6744	25.5733	25.8847	26.2205	26.4578	26.7059 (38)
Heat transfer coeff	47.4861	47.3499	47.2164	46.5894	46.4721	45.9260	45.9260	45.8249	46.1364	46.4721	46.7094	46.9575 (39)
Average = Sum(39)m / 12 =												46.5889 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8916	0.8890	0.8865	0.8748	0.8726	0.8623	0.8623	0.8604	0.8662	0.8726	0.8770	0.8817 (40)
HLP (average)												0.8747 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7862 (42)
Average daily hot water use (litres/day)												76.6228 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	84.2851	81.2201	78.1552	75.0903	72.0254	68.9605	68.9605	72.0254	75.0903	78.1552	81.2201	84.2851 (44)
Energy conte	124.9923	109.3191	112.8075	98.3483	94.3675	81.4320	75.4587	86.5900	87.6241	102.1175	111.4692	121.0484 (45)
Energy content (annual)										Total = Sum(45)m =		1205.5747 (45)
Distribution loss (46)m = 0.15 x (45)m	18.7488	16.3979	16.9211	14.7522	14.1551	12.2148	11.3188	12.9885	13.1436	15.3176	16.7204	18.1573 (46)
Water storage loss:												180.0000 (47)
Store volume												1.5520 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.8381 (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	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (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	174.2350	153.7963	162.0502	146.0025	143.6102	129.0862	124.7014	135.8327	135.2783	151.3602	159.1234	170.2910 (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	174.2350	153.7963	162.0502	146.0025	143.6102	129.0862	124.7014	135.8327	135.2783	151.3602	159.1234	170.2910 (64)
Heat gains from water heating, kWh/month	80.9541	71.9304	76.9026	70.8242	70.7713	65.1995	64.4842	68.1853	67.2584	73.3482	75.1869	79.6427 (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	89.3111	89.3111	89.3111	89.3111	89.3111	89.3111	89.3111	89.3111	89.3111	89.3111	89.3111	89.3111 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.6286	16.5457	13.4559	10.1870	7.6149	6.4288	6.9466	9.0294	12.1192	15.3881	17.9602	19.1463 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	155.6910	157.3065	153.2353	144.5682	133.6274	123.3447	116.4752	114.8596	118.9309	127.5980	138.5387	148.8215 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.9311	31.9311	31.9311	31.9311	31.9311	31.9311	31.9311	31.9311	31.9311	31.9311	31.9311	31.9311 (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)	-71.4489	-71.4489	-71.4489	-71.4489	-71.4489	-71.4489	-71.4489	-71.4489	-71.4489	-71.4489	-71.4489	-71.4489 (71)
Water heating gains (Table 5)	108.8092	107.0393	103.3637	98.3669	95.1228	90.5549	86.6723	91.6469	93.4144	98.5863	104.4262	107.0467 (72)
Total internal gains	335.9221	333.6849	322.8483	305.9154	289.1584	273.1217	262.8874	268.3293	277.2578	294.3658	313.7185	327.8078 (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				2.0200	19.6403	0.6300		0.7000	0.7700		12.1247 (80)	
Solar gains	12.1247	23.7185	39.0609	56.9680	69.8165	71.4696	68.0419	58.4470	45.4295	28.1439	15.1181	9.9708 (83)
Total gains	348.0468	357.4033	361.9092	362.8834	358.9749	344.5913	330.9293	326.7763	322.6873	322.5097	328.8366	337.7785 (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	77.8883	78.1123	78.3332	79.3874	79.5878	80.5341	80.5341	80.7118	80.1669	79.5878	79.1834	78.7650
alpha	6.1926	6.2075	6.2222	6.2925	6.3059	6.3689	6.3689	6.3808	6.3445	6.3059	6.2789	6.2510
util living area	0.9966	0.9952	0.9910	0.9768	0.9292	0.7870	0.6001	0.6305	0.8579	0.9726	0.9931	0.9971 (86)
MIT	20.1744	20.2471	20.3962	20.6115	20.8168	20.9577	20.9935	20.9912	20.9228	20.6850	20.4012	20.1619 (87)
Th 2	20.1747	20.1768	20.1790	20.1890	20.1909	20.1997	20.1997	20.2013	20.1963	20.1909	20.1871	20.1831 (88)
util rest of house	0.9955	0.9936	0.9878	0.9678	0.9004	0.7131	0.4965	0.5285	0.7980	0.9603	0.9905	0.9962 (89)
MIT 2	19.0706	19.1783	19.3967	19.7139	19.9967	20.1685	20.1969	20.1972	20.1316	19.8210	19.4109	19.0589 (90)
Living area fraction	19.6573	19.7464	19.9280	20.1910	20.4327	20.5880	20.6203	20.6192	20.5522	20.2802	19.9373	19.6452 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6573	19.7464	19.9280	20.1910	20.4327	20.5880	20.6203	20.6192	20.5522	20.2802	19.9373	19.6452 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9946	0.9926	0.9867	0.9679	0.9100	0.7508	0.5519	0.5830	0.8266	0.9619	0.9895	0.9955 (94)
Ext temp.	346.1730	354.7461	357.0814	351.2248	326.6708	258.7112	182.6258	190.5139	266.7449	310.2349	325.3764	336.2523 (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	729.2596	702.9774	634.0201	526.0419	405.8246	275.0038	184.6384	193.3465	297.6790	449.8602	599.6221	725.2672 (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	285.0165	234.0114	206.0424	125.8683	58.8905	0.0000	0.0000	0.0000	0.0000	103.8812	197.4569	289.4270 (98)
Space heating per m ²												1500.5943 (98)
										(98) / (4) =		28.1749 (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													1604.9137 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	285.0165	234.0114	206.0424	125.8683	58.8905	0.0000	0.0000	0.0000	0.0000	103.8812	197.4569	289.4270	(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)	304.8305	250.2796	220.3662	134.6185	62.9844	0.0000	0.0000	0.0000	0.0000	111.1029	211.1839	309.5476	(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	174.2350	153.7963	162.0502	146.0025	143.6102	129.0862	124.7014	135.8327	135.2783	151.3602	159.1234	170.2910	(64)
Efficiency of water heater (217)m	86.1191	85.9306	85.4556	84.4210	82.6415	79.8000	79.8000	79.8000	79.8000	83.8341	85.3906	86.2177	(216)
Fuel for water heating, kWh/month	202.3187	178.9773	189.6309	172.9456	173.7749	161.7622	156.2674	170.2164	169.5217	180.5474	186.3477	197.5129	(219)
Water heating fuel used												2139.8230	(219)
Annual totals kWh/year													
Space heating fuel - main system												1604.9137	(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)												328.9864	(232)
Total delivered energy for all uses												4148.7230	(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	1604.9137	0.2160	346.6614 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2139.8230	0.2160	462.2018 (264)
Space and water heating			808.8631 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	328.9864	0.5190	170.7439 (268)
Total CO2, kg/m2/year			1018.5320 (272)
Emissions per m2 for space and water heating			15.1871 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			3.2059 (272b)
Emissions per m2 for pumps and fans			0.7308 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.1871 * 1.00) + 3.2059 + 0.7308, rounded to 2 d.p.			19.1200 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 6			Issued on Date	13/04/2022
Assessment Reference	Unit 6_Be Green	Prop Type Ref	160 Malden Road		
Property	160, Malden Road				
SAP Rating	91 B	DER	12.41	TER	25.15
Environmental	92 A	% DER<TER	50.65		
CO ₂ Emissions (t/year)	0.62	DFEE	32.48	TFEE	40.25
General Requirements Compliance	Fail	% DFEE<TFEE	19.32		
Assessor Details	Mr. Andy Love, Love Design Studio Ltd, Tel: 07563755762, Mail@lovedesignstudio.co.uk			Assessor ID	U860-0001
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 63 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

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 25.15 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.41 kgCO₂/m²OK

1b TFEE and DFEE

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

Dwelling Fabric Energy Efficiency (DFEE)32.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.22 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.100

3 Air permeability

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

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric

Air-to-water heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 1.82 kWh/day	
Permitted by DBSCG 2.10	OK	
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
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Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK

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:	0.60	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley):	High	Fail
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Based on:

Overshading:	Average	
Windows facing South:	8.30 m ² , No overhang	
Windows facing West:	2.02 m ² , No overhang	
Air change rate:	2.00 ach	
Blinds/curtains:	None	

10 Key features

External wall U-value	0.14 W/m ² K
External wall U-value	0.14 W/m ² K
Party wall U-value	0.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	0.68 kW

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	62.9200 (1b)	x 2.7000 (2b)	= 169.8840 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.8840 (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) =												75.6500 (23c)
Effective ac	0.2700	0.2671	0.2642	0.2496	0.2467	0.2322	0.2322	0.2293	0.2380	0.2467	0.2525	0.2583 (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
windows (Uw = 1.20)			10.3200	1.1450	11.8168		(27)
Half glazed doors			6.2900	1.2000	7.5480		(26a)
Solid Door			2.0500	1.4000	2.8700		(26)
External Wall 1	28.7900	18.6600	10.1300	0.1400	1.4182		(29a)
Corridor	30.9800		30.9800	0.1342	4.1568		(29a)
Total net area of external elements Aum(A, m ²)			59.7700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	27.8098			(33)
Party Wall 1			35.9600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (User defined value 0.100 * total exposed area)							5.9770 (36)
Total fabric heat loss						(33) + (36) =	33.7868 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	15.1349	14.9720	14.8091	13.9944	13.8315	13.0168	13.0168	12.8539	13.3427	13.8315	14.1573	14.4832 (38)
Heat transfer coeff	48.9217	48.7588	48.5958	47.7812	47.6183	46.8036	46.8036	46.6407	47.1295	47.6183	47.9441	48.2700 (39)
Average = Sum(39)m / 12 =												47.7405 (39)
HLP	0.7775	0.7749	0.7723	0.7594	0.7568	0.7439	0.7439	0.7413	0.7490	0.7568	0.7620	0.7672 (40)
HLP (average)												0.7587 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0629 (42)
Average daily hot water use (litres/day)												83.1933 (43)
Daily hot water use	91.5126	88.1849	84.8572	81.5294	78.2017	74.8740	74.8740	78.2017	81.5294	84.8572	88.1849	91.5126 (44)
Energy conte	135.7106	118.6934	122.4809	106.7818	102.4597	88.4149	81.9294	94.0152	95.1381	110.8742	121.0279	131.4285 (45)
Energy content (annual)										Total = Sum(45)m =		1308.9547 (45)
Distribution loss (46)m = 0.15 x (45)m	20.3566	17.8040	18.3721	16.0173	15.3690	13.2622	12.2894	14.1023	14.2707	16.6311	18.1542	19.7143 (46)

Water storage loss:													
Store volume												180.0000 (47)	
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0115 (51)	
Volume factor from Table 2a												0.8736 (52)	
Temperature factor from Table 2b												0.5400 (53)	
Enter (49) or (54) in (55)												0.9805 (55)	
Total storage loss													
	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965	(56)
If cylinder contains dedicated solar storage													
	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965	(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													
	189.3695	167.1594	176.1398	158.7098	156.1186	140.3429	135.5883	147.6741	147.0660	164.5331	172.9559	185.0874	(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	(64)	
Output from w/h													
	189.3695	167.1594	176.1398	158.7098	156.1186	140.3429	135.5883	147.6741	147.0660	164.5331	172.9559	185.0874	(64)
								Total per year (kWh/year) = Sum(64)m =			1940.7448	(64)	
Heat gains from water heating, kWh/month													
	88.0509	78.2384	83.6520	77.0473	76.9950	70.9403	70.1686	74.1872	73.1758	79.7928	81.7841	86.6271	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.6840	14.8186	12.0513	9.1236	6.8200	5.7577	6.2214	8.0868	10.8541	13.7818	16.0854	17.1477 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.2466	182.1170	177.4037	167.3695	154.7032	142.7987	134.8458	132.9754	137.6887	147.7228	160.3891	172.2937 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144 (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)	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150 (71)
Water heating gains (Table 5)	118.3480	116.4262	112.4355	107.0102	103.4878	98.5282	94.3127	99.7139	101.6330	107.2484	113.5891	116.4342 (72)
Total internal gains	372.2217	370.3049	358.8336	340.4464	321.9542	304.0278	292.3230	297.7193	307.1190	325.6962	347.0068	362.8187 (73)

[Jan				Area	Solar flux	g		FF		Access		Gains
				m2	Table 6a	Table 6b		Table 6c		factor		W
					W/m2	or		or		Table 6d		
South				8.3000	46.7521	0.6300		0.7000		0.7700		118.5907
West				2.0200	19.6403	0.6300		0.7000		0.7700		12.1247 (80)
Solar gains	130.7154	217.9395	286.4641	336.5873	361.1970	351.8837	342.0236	324.5212	303.8713	237.6296	155.6885	112.4441 (83)
Total gains	502.9371	588.2444	645.2977	677.0337	683.1513	655.9115	634.3467	622.2405	610.9903	563.3257	502.6953	475.2628 (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	89.3151	89.6135	89.9140	91.4469	91.7598	93.3570	93.3570	93.6831	92.7115	91.7598	91.1362	90.5209
alpha	6.9543	6.9742	6.9943	7.0965	7.1173	7.2238	7.2238	7.2455	7.1808	7.1173	7.0757	7.0347
util living area	0.9865	0.9628	0.9099	0.7976	0.6375	0.4558	0.3246	0.3447	0.5295	0.8136	0.9628	0.9902 (86)
MIT	20.4863	20.6497	20.8117	20.9387	20.9882	20.9991	20.9999	20.9999	20.9973	20.9407	20.7070	20.4539 (87)
Th 2	20.2729	20.2751	20.2774	20.2887	20.2909	20.3023	20.3023	20.3045	20.2977	20.2909	20.2864	20.2819 (88)
util rest of house	0.9828	0.9536	0.8904	0.7634	0.5925	0.4065	0.2731	0.2926	0.4768	0.7745	0.9520	0.9875 (89)
MIT 2	19.5995	19.8323	20.0545	20.2424	20.2807	20.3017	20.3022	20.3045	20.2959	20.2317	19.9250	19.5605 (90)
Living area fraction												
MIT	19.8770	20.0881	20.2914	20.4479	20.5021	20.5199	20.5206	20.5221	20.5154	20.4535	20.1697	19.8401 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8770	20.0881	20.2914	20.4479	20.5021	20.5199	20.5206	20.5221	20.5154	20.4535	20.1697	19.8401 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9804	0.9509	0.8908	0.7714	0.6061	0.4219	0.2892	0.3089	0.4933	0.7839	0.9500	0.9854 (94)
Useful gains	493.0700	559.3545	574.8565	522.2331	414.0388	276.7571	183.4799	192.2309	301.3748	441.6105	477.5428	468.3046 (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	762.0539	740.5521	670.2068	551.7723	419.1414	277.0741	183.4966	192.2577	302.3553	469.2088	626.6145	754.9470 (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	200.1241	121.7648	70.9406	21.2682	3.7963	0.0000	0.0000	0.0000	0.0000	20.5332	107.3317	213.2620 (98)
Space heating												759.0208 (98)
Space heating per m2												12.0633 (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

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 %)													175.1000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													433.4785 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	200.1241	121.7648	70.9406	21.2682	3.7963	0.0000	0.0000	0.0000	0.0000	20.5332	107.3317	213.2620	(98)
Space heating efficiency (main heating system 1)	175.1000	175.1000	175.1000	175.1000	175.1000	0.0000	0.0000	0.0000	0.0000	175.1000	175.1000	175.1000	(210)
Space heating fuel (main heating system)	114.2913	69.5401	40.5143	12.1463	2.1681	0.0000	0.0000	0.0000	0.0000	11.7265	61.2974	121.7944	(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	189.3695	167.1594	176.1398	158.7098	156.1186	140.3429	135.5883	147.6741	147.0660	164.5331	172.9559	185.0874	(64)
Efficiency of water heater	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)
Fuel for water heating, kWh/month	108.1493	95.4651	100.5938	90.6395	89.1597	80.1501	77.4348	84.3370	83.9897	93.9652	98.7755	105.7038	(219)
Water heating fuel used												1108.3637	(219)
Annual totals kWh/year													
Space heating fuel - main system												433.4785	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)													155.4439 (230a)
central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													185.4439 (231)
Electricity for lighting (calculated in Appendix L)													294.6446 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.68 * 951 * 1.00) =										-517.1351		-517.1351	(233)
Total delivered energy for all uses												1504.7955	(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	433.4785	0.5190	224.9753 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1108.3637	0.5190	575.2407 (264)
Space and water heating			800.2161 (265)
Pumps and fans	185.4439	0.5190	96.2454 (267)
Energy for lighting	294.6446	0.5190	152.9205 (268)
Energy saving/generation technologies			
PV Unit	-517.1351	0.5190	-268.3931 (269)
Total CO2, kg/year			780.9888 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.4100 (273)

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

DER			12.4100 ZC1
Total Floor Area		TFA	62.9200
Assumed number of occupants		N	2.0629
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.9756 ZC2
CO2 emissions from cooking, equation (L16)			2.6781 ZC3
Total CO2 emissions			32.0637 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			32.0637 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	62.9200 (1b)	x 2.7000 (2b)	= 169.8840 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.8840 (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) = 0.1177 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3677 (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) =				0.2850 (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	0.3634	0.3562	0.3491	0.3135	0.3064	0.2707	0.2707	0.2636	0.2850	0.3064	0.3206	0.3349 (22b)
Effective ac	0.5660	0.5635	0.5609	0.5491	0.5469	0.5366	0.5366	0.5347	0.5406	0.5469	0.5514	0.5561 (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			2.0500	1.0000	2.0500		(26)
TER Semi-glazed door			6.2900	1.2000	7.5480		(26a)
TER Opening Type (Uw = 1.40)			7.3900	1.3258	9.7973		(27)
External Wall 1	28.7900	15.7300	13.0600	0.1800	2.3508		(29a)
Corridor	30.9800		30.9800	0.1800	5.5764		(29a)
Total net area of external elements Aum(A, m ²)			59.7700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.3225		(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)							4.1763 (36)
Total fabric heat loss						(33) + (36) =	31.4988 (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	31.7318	31.5881	31.4472	30.7856	30.6618	30.0855	30.0855	29.9788	30.3075	30.6618	30.9122	31.1740 (38)
Heat transfer coeff	63.2306	63.0869	62.9461	62.2844	62.1606	61.5844	61.5844	61.4776	61.8063	62.1606	62.4111	62.6729 (39)
Average = Sum(39)m / 12 =												62.2838 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0049	1.0027	1.0004	0.9899	0.9879	0.9788	0.9788	0.9771	0.9823	0.9879	0.9919	0.9961 (40)
HLP (average)												0.9899 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0629 (42)
Average daily hot water use (litres/day)												83.1933 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	91.5126	88.1849	84.8572	81.5294	78.2017	74.8740	74.8740	78.2017	81.5294	84.8572	88.1849	91.5126 (44)
Energy conte	135.7106	118.6934	122.4809	106.7818	102.4597	88.4149	81.9294	94.0152	95.1381	110.8742	121.0279	131.4285 (45)
Energy content (annual)										Total = Sum(45)m =		1308.9547 (45)
Distribution loss (46)m = 0.15 x (45)m	20.3566	17.8040	18.3721	16.0173	15.3690	13.2622	12.2894	14.1023	14.2707	16.6311	18.1542	19.7143 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8381 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (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	184.9533	163.1706	171.7236	154.4360	151.7024	136.0691	131.1721	143.2579	142.7923	160.1169	168.6821	180.6711 (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	184.9533	163.1706	171.7236	154.4360	151.7024	136.0691	131.1721	143.2579	142.7923	160.1169	168.6821	180.6711 (64)
Heat gains from water heating, kWh/month	84.5179	75.0473	80.1190	73.6283	73.4620	67.5213	66.6357	70.6542	69.7568	76.2598	78.3651	83.0941 (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	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.9210	15.9173	12.9448	9.8001	7.3257	6.1846	6.6827	8.6864	11.6589	14.8037	17.2781	18.4191 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.2466	182.1170	177.4037	167.3695	154.7032	142.7987	134.8458	132.9754	137.6887	147.7228	160.3891	172.2937 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144 (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)	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150 (71)
Water heating gains (Table 5)	113.5993	111.6776	107.6869	102.2616	98.7392	93.7796	89.5641	94.9653	96.8844	102.4998	108.8405	111.6856 (72)
Total internal gains	368.7101	366.6550	354.9785	336.3743	317.7113	299.7061	288.0357	293.5703	303.1752	321.9694	343.4508	359.3415 (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			
South				5.9400	46.7521	0.6300	0.7000	0.7700	84.8710 (78)			
West				1.4500	19.6403	0.6300	0.7000	0.7700	8.7034 (80)			

Solar gains	93.5743	156.0224	205.0960	241.0060	258.6460	251.9844	244.9205	232.3739	217.5674	170.1234	111.4531	80.4935 (83)
Total gains	462.2844	522.6774	560.0745	577.3803	576.3573	551.6905	532.9561	525.9442	520.7426	492.0928	454.9039	439.8351 (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	69.1033	69.2607	69.4157	70.1531	70.2928	70.9505	70.9505	71.0737	70.6957	70.2928	70.0107	69.7183
alpha	5.6069	5.6174	5.6277	5.6769	5.6862	5.7300	5.7300	5.7382	5.7130	5.6862	5.6674	5.6479
util living area	0.9945	0.9882	0.9742	0.9380	0.8517	0.6813	0.5032	0.5305	0.7548	0.9397	0.9876	0.9958 (86)
MIT	20.0859	20.2344	20.4368	20.6740	20.8659	20.9718	20.9957	20.9942	20.9486	20.7169	20.3572	20.0557 (87)
Th 2	20.0792	20.0811	20.0830	20.0918	20.0934	20.1011	20.1011	20.1025	20.0981	20.0934	20.0901	20.0866 (88)
util rest of house	0.9928	0.9846	0.9660	0.9177	0.8050	0.5990	0.4032	0.4308	0.6791	0.9159	0.9830	0.9944 (89)
MIT 2	18.8694	19.0857	19.3774	19.7152	19.9633	20.0823	20.0994	20.1001	20.0596	19.7794	19.2718	18.8309 (90)
Living area fraction									fLA = Living area / (4) =			0.3129 (91)
MIT	19.2501	19.4452	19.7089	20.0152	20.2458	20.3607	20.3799	20.3799	20.3378	20.0728	19.6114	19.2142 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2501	19.4452	19.7089	20.0152	20.2458	20.3607	20.3799	20.3799	20.3378	20.0728	19.6114	19.2142 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	457.9660	512.9122	538.7346	528.6890	468.9627	344.1347	231.6406	243.0439	364.8108	450.3967	445.7700	436.6214 (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	945.3032	917.6097	831.4507	692.3052	531.2100	354.7673	232.7833	244.6738	385.5354	588.8326	780.8518	940.9831 (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	362.5788	271.9567	217.7808	117.8036	46.3120	0.0000	0.0000	0.0000	0.0000	102.9963	241.2589	375.2451 (98)
Space heating												1735.9323 (98)
Space heating per m2										(98) / (4) =		27.5895 (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													1856.6121 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	362.5788	271.9567	217.7808	117.8036	46.3120	0.0000	0.0000	0.0000	0.0000	102.9963	241.2589	375.2451	(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)	387.7848	290.8628	232.9207	125.9932	49.5316	0.0000	0.0000	0.0000	0.0000	110.1564	258.0309	401.3317	(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	184.9533	163.1706	171.7236	154.4360	151.7024	136.0691	131.1721	143.2579	142.7923	160.1169	168.6821	180.6711	(64)
Efficiency of water heater (217)m	86.5786	86.1674	85.4487	84.1028	82.0694	79.8000	79.8000	79.8000	79.8000	83.6726	85.7679	79.8000	(216)
Fuel for water heating, kWh/month	213.6248	189.3647	200.9669	183.6277	184.8464	170.5127	164.3761	179.5212	178.9377	191.3613	196.6728	208.3362	(219)
Water heating fuel used												2262.1484	(219)
Annual totals kWh/year													
Space heating fuel - main system												1856.6121	(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)												316.4908	(232)
Total delivered energy for all uses												4510.2513	(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	1856.6121	0.2160	401.0282 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2262.1484	0.2160	488.6241 (264)
Space and water heating			889.6523 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	316.4908	0.5190	164.2587 (268)
Total CO2, kg/m2/year			1092.8360 (272)
Emissions per m2 for space and water heating			14.1394 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.6106 (272b)
Emissions per m2 for pumps and fans			0.6186 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.1394 * 1.55) + 2.6106 + 0.6186, rounded to 2 d.p.			25.1500 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 6			Issued on Date	13/04/2022
Assessment Reference	Unit 6_Be Lean	Prop Type Ref	160 Malden Road		
Property	160, Malden Road				
SAP Rating	85 B	DER	14.22	TER	17.37
Environmental	90 B	% DER<TER	18.13		
CO ₂ Emissions (t/year)	0.78	DFEE	32.48	TFEE	40.25
General Requirements Compliance	Fail	% DFEE<TFEE	19.32		
Assessor Details	Mr. Andy Love, Love Design Studio Ltd, Tel: 07563755762, Mail@lovedesignstudio.co.uk			Assessor ID	U860-0001
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 63 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
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.37 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.22 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 40.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 32.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.22 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.100

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
x x

Efficiency: 90%	
Minimum: 88%	OK

Secondary heating system:	None
---------------------------	------

5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 1.82 kWh/day
Permitted by DBSCG 2.10	OK
Primary pipework insulated:	Yes OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
-------------------------	-----------------------------------	----

Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK

Boiler interlock	Yes	OK
------------------	-----	----

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:	0.60
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:	9.30 m ² , No overhang	
Windows facing West:	2.02 m ² , No overhang	
Air change rate:	2.00 ach	
Blinds/curtains:	None	

10 Key features

External wall U-value	0.14 W/m ² K
External wall U-value	0.14 W/m ² K
Party wall U-value	0.00 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	62.9200 (1b)	x 2.7000 (2b)	= 169.8840 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.8840 (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:												75.6500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2700	0.2671	0.2642	0.2496	0.2467	0.2322	0.2322	0.2293	0.2380	0.2467	0.2525	0.2583 (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
windows (Uw = 1.20)			10.3200	1.1450	11.8168		(27)
Half glazed doors			6.2900	1.2000	7.5480		(26a)
Solid Door			2.0500	1.4000	2.8700		(26)
External Wall 1	28.7900	18.6600	10.1300	0.1400	1.4182		(29a)
Corridor	30.9800		30.9800	0.1342	4.1568		(29a)
Total net area of external elements Aum(A, m ²)			59.7700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	27.8098			(33)
Party Wall 1			35.9600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (User defined value 0.100 * total exposed area)							5.9770 (36)
Total fabric heat loss							(33) + (36) = 33.7868 (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	15.1349	14.9720	14.8091	13.9944	13.8315	13.0168	13.0168	12.8539	13.3427	13.8315	14.1573	14.4832 (38)
Heat transfer coeff	48.9217	48.7588	48.5958	47.7812	47.6183	46.8036	46.8036	46.6407	47.1295	47.6183	47.9441	48.2700 (39)
Average = Sum(39)m / 12 =												47.7405 (39)
HLP	0.7775	0.7749	0.7723	0.7594	0.7568	0.7439	0.7439	0.7413	0.7490	0.7568	0.7620	0.7672 (40)
HLP (average)												0.7587 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0629 (42)
Average daily hot water use (litres/day)												83.1933 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	91.5126	88.1849	84.8572	81.5294	78.2017	74.8740	74.8740	78.2017	81.5294	84.8572	88.1849	91.5126 (44)
Energy content (annual)	135.7106	118.6934	122.4809	106.7818	102.4597	88.4149	81.9294	94.0152	95.1381	110.8742	121.0279	131.4285 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1308.9547 (45)
	20.3566	17.8040	18.3721	16.0173	15.3690	13.2622	12.2894	14.1023	14.2707	16.6311	18.1542	19.7143 (46)

Water storage loss:													
Store volume												180.0000 (47)	
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0115 (51)	
Volume factor from Table 2a												0.8736 (52)	
Temperature factor from Table 2b												0.5400 (53)	
Enter (49) or (54) in (55)												0.9805 (55)	
Total storage loss													
	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965	(56)
If cylinder contains dedicated solar storage													
	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965	(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													
	189.3695	167.1594	176.1398	158.7098	156.1186	140.3429	135.5883	147.6741	147.0660	164.5331	172.9559	185.0874	(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													
	189.3695	167.1594	176.1398	158.7098	156.1186	140.3429	135.5883	147.6741	147.0660	164.5331	172.9559	185.0874	(64)
												Total per year (kWh/year) = Sum(64)m =	1940.7448 (64)
Heat gains from water heating, kWh/month													
	88.0509	78.2384	83.6520	77.0473	76.9950	70.9403	70.1686	74.1872	73.1758	79.7928	81.7841	86.6271	(65)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9793	0.9486	0.8864	0.7639	0.5964	0.4113	0.2782	0.2977	0.4819	0.7753	0.9472	0.9846 (94)
Useful gains	492.5507	558.0042	571.9744	517.1627	407.4519	269.7922	176.4637	185.2415	294.4599	436.7198	476.1614	467.9243 (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	754.7157	733.2382	662.9174	544.6051	411.9987	270.0536	176.4761	185.2616	295.2859	462.0660	619.4229	747.7065 (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	195.0507	117.7573	67.6616	19.7586	3.3828	0.0000	0.0000	0.0000	0.0000	18.8576	103.1483	208.1580 (98)
Space heating												733.7748 (98)
Space heating per m2										(98) / (4) =		11.6620 (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

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 %)													89.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													819.8601 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	195.0507	117.7573	67.6616	19.7586	3.3828	0.0000	0.0000	0.0000	0.0000	18.8576	103.1483	208.1580	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	217.9338	131.5724	75.5996	22.0766	3.7796	0.0000	0.0000	0.0000	0.0000	21.0699	115.2495	232.5787	(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	189.3695	167.1594	176.1398	158.7098	156.1186	140.3429	135.5883	147.6741	147.0660	164.5331	172.9559	185.0874	(64)
Efficiency of water heater (217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(216)
Fuel for water heating, kWh/month	211.5860	186.7703	196.8042	177.3294	174.4342	156.8077	151.4953	164.9990	164.3196	183.8359	193.2468	206.8015	(219)
Water heating fuel used												2168.4299	(219)
Annual totals kWh/year													
Space heating fuel - main system												819.8601	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)													155.4439 (230a)
central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													185.4439 (231)
Electricity for lighting (calculated in Appendix L)													294.6446 (232)
Total delivered energy for all uses													3468.3785 (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	819.8601	0.2160	177.0898 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2168.4299	0.2160	468.3809 (264)
Space and water heating			645.4707 (265)
Pumps and fans	185.4439	0.5190	96.2454 (267)
Energy for lighting	294.6446	0.5190	152.9205 (268)
Total CO2, kg/year			894.6365 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.2200 (273)

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

DER		14.2200	ZC1
Total Floor Area	TFA	62.9200	
Assumed number of occupants	N	2.0629	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.9756	ZC2
CO2 emissions from cooking, equation (L16)		2.6781	ZC3
Total CO2 emissions		33.8737	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		33.8737	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	62.9200 (1b)	x 2.7000 (2b)	= 169.8840 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.8840 (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) =	0.1177 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3677 (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) =		0.2850 (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	0.3634	0.3562	0.3491	0.3135	0.3064	0.2707	0.2707	0.2636	0.2850	0.3064	0.3206	0.3349 (22b)
Effective ac	0.5660	0.5635	0.5609	0.5491	0.5469	0.5366	0.5366	0.5347	0.5406	0.5469	0.5514	0.5561 (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			2.0500	1.0000	2.0500		(26)
TER Semi-glazed door			6.2900	1.2000	7.5480		(26a)
TER Opening Type (Uw = 1.40)			7.3900	1.3258	9.7973		(27)
External Wall 1	28.7900	15.7300	13.0600	0.1800	2.3508		(29a)
Corridor	30.9800		30.9800	0.1800	5.5764		(29a)
Total net area of external elements Aum(A, m ²)			59.7700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.3225		(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)							4.1763 (36)
Total fabric heat loss						(33) + (36) =	31.4988 (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	31.7318	31.5881	31.4472	30.7856	30.6618	30.0855	30.0855	29.9788	30.3075	30.6618	30.9122	31.1740 (38)
Heat transfer coeff	63.2306	63.0869	62.9461	62.2844	62.1606	61.5844	61.5844	61.4776	61.8063	62.1606	62.4111	62.6729 (39)
Average = Sum(39)m / 12 =												62.2838 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0049	1.0027	1.0004	0.9899	0.9879	0.9788	0.9788	0.9771	0.9823	0.9879	0.9919	0.9961 (40)
HLP (average)												0.9899 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0629 (42)
Average daily hot water use (litres/day)												83.1933 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	91.5126	88.1849	84.8572	81.5294	78.2017	74.8740	74.8740	78.2017	81.5294	84.8572	88.1849	91.5126 (44)
Energy conte	135.7106	118.6934	122.4809	106.7818	102.4597	88.4149	81.9294	94.0152	95.1381	110.8742	121.0279	131.4285 (45)
Energy content (annual)										Total = Sum(45)m =		1308.9547 (45)
Distribution loss (46)m = 0.15 x (45)m	20.3566	17.8040	18.3721	16.0173	15.3690	13.2622	12.2894	14.1023	14.2707	16.6311	18.1542	19.7143 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8381 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (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	184.9533	163.1706	171.7236	154.4360	151.7024	136.0691	131.1721	143.2579	142.7923	160.1169	168.6821	180.6711 (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	184.9533	163.1706	171.7236	154.4360	151.7024	136.0691	131.1721	143.2579	142.7923	160.1169	168.6821	180.6711 (64)
Heat gains from water heating, kWh/month	84.5179	75.0473	80.1190	73.6283	73.4620	67.5213	66.6357	70.6542	69.7568	76.2598	78.3651	83.0941 (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	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.9210	15.9173	12.9448	9.8001	7.3257	6.1846	6.6827	8.6864	11.6589	14.8037	17.2781	18.4191 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.2466	182.1170	177.4037	167.3695	154.7032	142.7987	134.8458	132.9754	137.6887	147.7228	160.3891	172.2937 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144 (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)	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150 (71)
Water heating gains (Table 5)	113.5993	111.6776	107.6869	102.2616	98.7392	93.7796	89.5641	94.9653	96.8844	102.4998	108.8405	111.6856 (72)
Total internal gains	368.7101	366.6550	354.9785	336.3743	317.7113	299.7061	288.0357	293.5703	303.1752	321.9694	343.4508	359.3415 (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
South					5.9400	46.7521	0.6300	0.7000			0.7700	84.8710 (78)
West					1.4500	19.6403	0.6300	0.7000			0.7700	8.7034 (80)
Solar gains	93.5743	156.0224	205.0960	241.0060	258.6460	251.9844	244.9205	232.3739	217.5674	170.1234	111.4531	80.4935 (83)
Total gains	462.2844	522.6774	560.0745	577.3803	576.3573	551.6905	532.9561	525.9442	520.7426	492.0928	454.9039	439.8351 (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	69.1033	69.2607	69.4157	70.1531	70.2928	70.9505	70.9505	71.0737	70.6957	70.2928	70.0107	69.7183
alpha	5.6069	5.6174	5.6277	5.6769	5.6862	5.7300	5.7300	5.7382	5.7130	5.6862	5.6674	5.6479
util living area	0.9945	0.9882	0.9742	0.9380	0.8517	0.6813	0.5032	0.5305	0.7548	0.9397	0.9876	0.9958 (86)
MIT	20.0859	20.2344	20.4368	20.6740	20.8659	20.9718	20.9957	20.9942	20.9486	20.7169	20.3572	20.0557 (87)
Th 2	20.0792	20.0811	20.0830	20.0918	20.0934	20.1011	20.1011	20.1025	20.0981	20.0934	20.0901	20.0866 (88)
util rest of house	0.9928	0.9846	0.9660	0.9177	0.8050	0.5990	0.4032	0.4308	0.6791	0.9159	0.9830	0.9944 (89)
MIT 2	18.8694	19.0857	19.3774	19.7152	19.9633	20.0823	20.0994	20.1001	20.0596	19.7794	19.2718	18.8309 (90)
Living area fraction									fLA = Living area / (4) =			0.3129 (91)
MIT	19.2501	19.4452	19.7089	20.0152	20.2458	20.3607	20.3799	20.3799	20.3378	20.0728	19.6114	19.2142 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2501	19.4452	19.7089	20.0152	20.2458	20.3607	20.3799	20.3799	20.3378	20.0728	19.6114	19.2142 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	457.9660	512.9122	538.7346	528.6890	468.9627	344.1347	231.6406	243.0439	364.8108	450.3967	445.7700	436.6214 (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	945.3032	917.6097	831.4507	692.3052	531.2100	354.7673	232.7833	244.6738	385.5354	588.8326	780.8518	940.9831 (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	362.5788	271.9567	217.7808	117.8036	46.3120	0.0000	0.0000	0.0000	0.0000	102.9963	241.2589	375.2451 (98)
Space heating												1735.9323 (98)
Space heating per m2										(98) / (4) =		27.5895 (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												1856.6121 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	362.5788	271.9567	217.7808	117.8036	46.3120	0.0000	0.0000	0.0000	0.0000	102.9963	241.2589	375.2451 (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)	387.7848	290.8628	232.9207	125.9932	49.5316	0.0000	0.0000	0.0000	0.0000	110.1564	258.0309	401.3317 (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	184.9533	163.1706	171.7236	154.4360	151.7024	136.0691	131.1721	143.2579	142.7923	160.1169	168.6821	180.6711 (64)
Efficiency of water heater (217)m	86.5786	86.1674	85.4487	84.1028	82.0694	79.8000	79.8000	79.8000	79.8000	83.6726	85.7679	79.8000 (216)
Fuel for water heating, kWh/month	213.6248	189.3647	200.9669	183.6277	184.8464	170.5127	164.3761	179.5212	178.9377	191.3613	196.6728	208.3362 (219)
Water heating fuel used												2262.1484 (219)
Annual totals kWh/year												
Space heating fuel - main system												1856.6121 (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)												316.4908 (232)
Total delivered energy for all uses												4510.2513 (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	1856.6121	0.2160	401.0282 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2262.1484	0.2160	488.6241 (264)
Space and water heating			889.6523 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	316.4908	0.5190	164.2587 (268)
Total CO2, kg/m2/year			1092.8360 (272)
Emissions per m2 for space and water heating			14.1394 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.6106 (272b)
Emissions per m2 for pumps and fans			0.6186 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.1394 * 1.00) + 2.6106 + 0.6186, rounded to 2 d.p.			17.3700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 7			Issued on Date	13/04/2022
Assessment Reference	Unit 7_Be Green	Prop Type Ref	160 Malden Road		
Property	160, Malden Road				
SAP Rating	91 B	DER	12.00	TER	24.70
Environmental	92 A	% DER<TER	51.42		
CO ₂ Emissions (t/year)	0.60	DFEE	30.84	TFEE	38.73
General Requirements Compliance	Fail	% DFEE<TFEE	20.39		
Assessor Details	Mr. Andy Love, Love Design Studio Ltd, Tel: 07563755762, Mail@lovedesignstudio.co.uk			Assessor ID	U860-0001
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 63 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

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 24.70 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.00 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)38.7 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)30.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.22 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.100

3 Air permeability

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

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric
Air-to-water heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 1.82 kWh/day	
Permitted by DBSCG 2.10	OK	
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

Cylinderstat OK
Independent timer for DHW OK

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:	0.60
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 East:	2.02 m ² , No overhang
Windows facing South:	8.30 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

External wall U-value	0.14 W/m ² K
External wall U-value	0.14 W/m ² K
Party wall U-value	0.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	0.68 kW

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	62.9200 (1b)	x 2.7000 (2b)	= 169.8840 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.8840 (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:												75.6500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2700	0.2671	0.2642	0.2496	0.2467	0.2322	0.2322	0.2293	0.2380	0.2467	0.2525	0.2583 (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
windows (Uw = 1.20)			10.3200	1.1450	11.8168		(27)
Half glazed doors			6.2900	1.2000	7.5480		(26a)
Solid Door			2.0500	1.4000	2.8700		(26)
External Wall 1	28.7900	18.6600	10.1300	0.1400	1.4182		(29a)
Corridor	23.0600		23.0600	0.1342	3.0941		(29a)
Total net area of external elements Aum(A, m ²)			51.8500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	26.7471			(33)
Party Wall 1			43.8800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (User defined value 0.100 * total exposed area)							5.1850 (36)
Total fabric heat loss							(33) + (36) = 31.9321 (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	15.1349	14.9720	14.8091	13.9944	13.8315	13.0168	13.0168	12.8539	13.3427	13.8315	14.1573	14.4832 (38)
Heat transfer coeff	47.0670	46.9041	46.7412	45.9265	45.7636	44.9489	44.9489	44.7860	45.2748	45.7636	46.0894	46.4153 (39)
Average = Sum(39)m / 12 =												45.8858 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7480	0.7455	0.7429	0.7299	0.7273	0.7144	0.7144	0.7118	0.7196	0.7273	0.7325	0.7377 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0629 (42)
Average daily hot water use (litres/day)												83.1933 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	91.5126	88.1849	84.8572	81.5294	78.2017	74.8740	74.8740	78.2017	81.5294	84.8572	88.1849	91.5126 (44)
Energy content (annual)	135.7106	118.6934	122.4809	106.7818	102.4597	88.4149	81.9294	94.0152	95.1381	110.8742	121.0279	131.4285 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1308.9547 (45)
	20.3566	17.8040	18.3721	16.0173	15.3690	13.2622	12.2894	14.1023	14.2707	16.6311	18.1542	19.7143 (46)

Water storage loss:												
Store volume												
180.0000 (47)												
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												
30.3965 27.4549 30.3965 29.4160 30.3965 29.4160 30.3965 30.3965 29.4160 30.3965 29.4160 30.3965 (56)												
If cylinder contains dedicated solar storage												
30.3965 27.4549 30.3965 29.4160 30.3965 29.4160 30.3965 30.3965 29.4160 30.3965 29.4160 30.3965 (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												
189.3695 167.1594 176.1398 158.7098 156.1186 140.3429 135.5883 147.6741 147.0660 164.5331 172.9559 185.0874 (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												
189.3695 167.1594 176.1398 158.7098 156.1186 140.3429 135.5883 147.6741 147.0660 164.5331 172.9559 185.0874 (64)												
Heat gains from water heating, kWh/month												
88.0509 78.2384 83.6520 77.0473 76.9950 70.9403 70.1686 74.1872 73.1758 79.7928 81.7841 86.6271 (65)												

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.6840	14.8186	12.0513	9.1236	6.8200	5.7577	6.2214	8.0868	10.8541	13.7818	16.0854	17.1477 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.2466	182.1170	177.4037	167.3695	154.7032	142.7987	134.8458	132.9754	137.6887	147.7228	160.3891	172.2937 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144 (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)	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150 (71)
Water heating gains (Table 5)	118.3480	116.4262	112.4355	107.0102	103.4878	98.5282	94.3127	99.7139	101.6330	107.2484	113.5891	116.4342 (72)
Total internal gains	372.2217	370.3049	358.8336	340.4464	321.9542	304.0278	292.3230	297.7193	307.1190	325.6962	347.0068	362.8187 (73)

[Jan					Area	Solar flux	g		FF	Access		Gains
					m2	Table 6a	Table 6b		Table 6c	factor		W
						W/m2	or		or	Table 6d		
East					2.0200	19.6403	0.6300		0.7000	0.7700		12.1247 (76)
South					8.3000	46.7521	0.6300		0.7000	0.7700		118.5907 (78)
Solar gains	130.7154	217.9395	286.4641	336.5873	361.1970	351.8837	342.0236	324.5212	303.8713	237.6296	155.6885	112.4441 (83)
Total gains	502.9371	588.2444	645.2977	677.0337	683.1513	655.9115	634.3467	622.2405	610.9903	563.3257	502.6953	475.2628 (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	92.8345	93.1570	93.4817	95.1399	95.4786	97.2091	97.2091	97.5627	96.5094	95.4786	94.8036	94.1380
alpha	7.1890	7.2105	7.2321	7.3427	7.3652	7.4806	7.4806	7.5042	7.4340	7.3652	7.3202	7.2759
util living area	0.9851	0.9581	0.8990	0.7781	0.6157	0.4381	0.3117	0.3310	0.5096	0.7948	0.9579	0.9892 (86)
MIT	20.5320	20.6913	20.8426	20.9532	20.9919	20.9994	21.0000	20.9999	20.9983	20.9544	20.7430	20.5003 (87)
Th 2	20.2986	20.3009	20.3031	20.3145	20.3168	20.3281	20.3281	20.3304	20.3236	20.3168	20.3122	20.3077 (88)
util rest of house	0.9811	0.9482	0.8784	0.7440	0.5729	0.3923	0.2642	0.2829	0.4604	0.7556	0.9462	0.9862 (89)
MIT 2	19.6862	19.9124	20.1182	20.2659	20.3098	20.3278	20.3281	20.3304	20.3224	20.2717	19.9968	19.6483 (90)
Living area fraction									fLA = Living area / (4)			0.3129 (91)
MIT	19.9509	20.1561	20.3449	20.4810	20.5232	20.5380	20.5384	20.5399	20.5339	20.4853	20.2303	19.9149 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9509	20.1561	20.3449	20.4810	20.5232	20.5380	20.5384	20.5399	20.5339	20.4853	20.2303	19.9149 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9786	0.9458	0.8798	0.7525	0.5860	0.4066	0.2791	0.2979	0.4757	0.7656	0.9446	0.9841 (94)
Useful gains	492.1993	556.3862	567.7092	509.4988	400.3064	266.7163	177.0166	185.3961	290.6756	431.3081	474.8601	467.7089 (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												
	736.6416	715.5756	647.1254	531.8752	403.7833	266.9063	177.0257	185.4109	291.2956	452.3869	605.1699	729.4134 (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												
	181.8651	106.9753	59.0857	16.1110	2.5868	0.0000	0.0000	0.0000	0.0000	15.6826	93.8231	194.7081 (98)
Space heating												670.8377 (98)
Space heating per m2												10.6618 (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

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 %)													175.1000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													383.1169 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	181.8651	106.9753	59.0857	16.1110	2.5868	0.0000	0.0000	0.0000	0.0000	15.6826	93.8231	194.7081	(98)
Space heating efficiency (main heating system 1)	175.1000	175.1000	175.1000	175.1000	175.1000	0.0000	0.0000	0.0000	0.0000	175.1000	175.1000	175.1000	(210)
Space heating fuel (main heating system)	103.8636	61.0938	33.7440	9.2010	1.4773	0.0000	0.0000	0.0000	0.0000	8.9564	53.5826	111.1982	(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	189.3695	167.1594	176.1398	158.7098	156.1186	140.3429	135.5883	147.6741	147.0660	164.5331	172.9559	185.0874	(64)
Efficiency of water heater	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)
(217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(217)
Fuel for water heating, kWh/month	108.1493	95.4651	100.5938	90.6395	89.1597	80.1501	77.4348	84.3370	83.9897	93.9652	98.7755	105.7038	(219)
Water heating fuel used												1108.3637	(219)
Annual totals kWh/year													
Space heating fuel - main system												383.1169	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)													155.4439 (230a)
central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													185.4439 (231)
Electricity for lighting (calculated in Appendix L)													294.6446 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.68 * 951 * 1.00) =										-517.1351		-517.1351	(233)
Total delivered energy for all uses												1454.4339	(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	383.1169	0.5190	198.8377 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1108.3637	0.5190	575.2407 (264)
Space and water heating			774.0784 (265)
Pumps and fans	185.4439	0.5190	96.2454 (267)
Energy for lighting	294.6446	0.5190	152.9205 (268)
Energy saving/generation technologies			
PV Unit	-517.1351	0.5190	-268.3931 (269)
Total CO2, kg/year			754.8512 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.0000 (273)

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

DER			12.0000 ZC1
Total Floor Area		TFA	62.9200
Assumed number of occupants		N	2.0629
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.9756 ZC2
CO2 emissions from cooking, equation (L16)			2.6781 ZC3
Total CO2 emissions			31.6537 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			31.6537 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	62.9200 (1b)	x 2.7000 (2b)	= 169.8840 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.8840 (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) = 0.1177 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3677 (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) =				0.2850 (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	0.3634	0.3562	0.3491	0.3135	0.3064	0.2707	0.2707	0.2636	0.2850	0.3064	0.3206	0.3349 (22b)
Effective ac	0.5660	0.5635	0.5609	0.5491	0.5469	0.5366	0.5366	0.5347	0.5406	0.5469	0.5514	0.5561 (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			2.0500	1.0000	2.0500		(26)
TER Semi-glazed door			6.2900	1.2000	7.5480		(26a)
TER Opening Type (Uw = 1.40)			7.3900	1.3258	9.7973		(27)
External Wall 1	28.7900	15.7300	13.0600	0.1800	2.3508		(29a)
Corridor	23.0600		23.0600	0.1800	4.1508		(29a)
Total net area of external elements Aum(A, m ²)			51.8500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	25.8969		(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)							4.1763 (36)
Total fabric heat loss						(33) + (36) =	30.0732 (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	31.7318	31.5881	31.4472	30.7856	30.6618	30.0855	30.0855	29.9788	30.3075	30.6618	30.9122	31.1740 (38)
Heat transfer coeff	61.8050	61.6613	61.5205	60.8588	60.7350	60.1588	60.1588	60.0520	60.3807	60.7350	60.9855	61.2473 (39)
Average = Sum(39)m / 12 =												60.8582 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9823	0.9800	0.9778	0.9672	0.9653	0.9561	0.9561	0.9544	0.9596	0.9653	0.9693	0.9734 (40)
HLP (average)												0.9672 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0629 (42)
Average daily hot water use (litres/day)												83.1933 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	91.5126	88.1849	84.8572	81.5294	78.2017	74.8740	74.8740	78.2017	81.5294	84.8572	88.1849	91.5126 (44)
Energy conte	135.7106	118.6934	122.4809	106.7818	102.4597	88.4149	81.9294	94.0152	95.1381	110.8742	121.0279	131.4285 (45)
Energy content (annual)										Total = Sum(45)m =		1308.9547 (45)
Distribution loss (46)m = 0.15 x (45)m	20.3566	17.8040	18.3721	16.0173	15.3690	13.2622	12.2894	14.1023	14.2707	16.6311	18.1542	19.7143 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8381 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (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	184.9533	163.1706	171.7236	154.4360	151.7024	136.0691	131.1721	143.2579	142.7923	160.1169	168.6821	180.6711 (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	184.9533	163.1706	171.7236	154.4360	151.7024	136.0691	131.1721	143.2579	142.7923	160.1169	168.6821	180.6711 (64)
Heat gains from water heating, kWh/month	84.5179	75.0473	80.1190	73.6283	73.4620	67.5213	66.6357	70.6542	69.7568	76.2598	78.3651	83.0941 (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	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.9210	15.9173	12.9448	9.8001	7.3257	6.1846	6.6827	8.6864	11.6589	14.8037	17.2781	18.4191 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.2466	182.1170	177.4037	167.3695	154.7032	142.7987	134.8458	132.9754	137.6887	147.7228	160.3891	172.2937 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144 (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)	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150 (71)
Water heating gains (Table 5)	113.5993	111.6776	107.6869	102.2616	98.7392	93.7796	89.5641	94.9653	96.8844	102.4998	108.8405	111.6856 (72)
Total internal gains	368.7101	366.6550	354.9785	336.3743	317.7113	299.7061	288.0357	293.5703	303.1752	321.9694	343.4508	359.3415 (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
East					1.4500	19.6403	0.6300	0.7000			0.7700	8.7034 (76)
South					5.9400	46.7521	0.6300	0.7000			0.7700	84.8710 (78)
Solar gains	93.5743	156.0224	205.0960	241.0060	258.6460	251.9844	244.9205	232.3739	217.5674	170.1234	111.4531	80.4935 (83)
Total gains	462.2844	522.6774	560.0745	577.3803	576.3573	551.6905	532.9561	525.9442	520.7426	492.0928	454.9039	439.8351 (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	70.6972	70.8620	71.0242	71.7964	71.9427	72.6319	72.6319	72.7610	72.3649	71.9427	71.6473	71.3410
alpha	5.7131	5.7241	5.7349	5.7864	5.7962	5.8421	5.8421	5.8507	5.8243	5.7962	5.7765	5.7561
util living area	0.9944	0.9878	0.9730	0.9346	0.8441	0.6697	0.4924	0.5194	0.7443	0.9364	0.9871	0.9957 (86)
MIT	20.1186	20.2661	20.4652	20.6962	20.8790	20.9759	20.9965	20.9953	20.9551	20.7361	20.3847	20.0885 (87)
Th 2	20.0981	20.1000	20.1019	20.1107	20.1124	20.1201	20.1201	20.1215	20.1171	20.1124	20.1090	20.1055 (88)
util rest of house	0.9926	0.9841	0.9646	0.9137	0.7970	0.5892	0.3962	0.4233	0.6693	0.9119	0.9824	0.9943 (89)
MIT 2	18.9310	19.1459	19.4326	19.7608	19.9956	20.1041	20.1187	20.1195	20.0837	19.8206	19.3258	18.8929 (90)
Living area fraction	19.3027	19.4965	19.7557	20.0535	20.2721	20.3770	20.3934	20.3936	20.3564	20.1071	19.6572	0.3129 (91)
MIT	19.3027	19.4965	19.7557	20.0535	20.2721	20.3770	20.3934	20.3936	20.3564	20.1071	19.6572	19.2671 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3027	19.4965	19.7557	20.0535	20.2721	20.3770	20.3934	20.3936	20.3564	20.1071	19.6572	19.2671 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9905	0.9808	0.9605	0.9121	0.8062	0.6136	0.4265	0.4535	0.6909	0.9117	0.9794	0.9926 (94)
Useful gains	457.8969	512.6529	537.9789	526.6376	464.6707	338.5071	227.2859	238.4979	359.7560	448.6572	445.5129	436.5799 (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	927.2410	900.0387	815.4970	678.7899	520.6260	347.5343	228.2082	239.8227	377.7638	577.4113	765.8065	922.8179 (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	349.1920	260.3233	206.4735	109.5496	41.6307	0.0000	0.0000	0.0000	0.0000	95.7931	230.6113	361.7611 (98)
Space heating												1655.3346 (98)
Space heating per m2										(98) / (4) =		26.3086 (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												1770.4114 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	349.1920	260.3233	206.4735	109.5496	41.6307	0.0000	0.0000	0.0000	0.0000	95.7931	230.6113	361.7611 (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)	373.4674	278.4206	220.8272	117.1654	44.5249	0.0000	0.0000	0.0000	0.0000	102.4525	246.6432	386.9102 (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	184.9533	163.1706	171.7236	154.4360	151.7024	136.0691	131.1721	143.2579	142.7923	160.1169	168.6821	180.6711 (64)
Efficiency of water heater (217)m	86.4847	86.0542	85.3063	83.9173	81.8847	79.8000	79.8000	79.8000	79.8000	83.4953	85.6485	79.8000 (216)
Fuel for water heating, kWh/month	213.8567	189.6137	201.3023	184.0335	185.2634	170.5127	164.3761	179.5212	178.9377	191.7677	196.9470	208.5525 (219)
Water heating fuel used												2264.6844 (219)
Annual totals kWh/year												
Space heating fuel - main system												1770.4114 (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)												316.4908 (232)
Total delivered energy for all uses												4426.5866 (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	1770.4114	0.2160	382.4089 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2264.6844	0.2160	489.1718 (264)
Space and water heating			871.5807 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	316.4908	0.5190	164.2587 (268)
Total CO2, kg/m2/year			1074.7644 (272)
Emissions per m2 for space and water heating			13.8522 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.6106 (272b)
Emissions per m2 for pumps and fans			0.6186 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.8522 * 1.55) + 2.6106 + 0.6186, rounded to 2 d.p.			24.7000 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 7			Issued on Date	13/04/2022
Assessment Reference	Unit 7_Be Lean	Prop Type Ref	160 Malden Road		
Property	160, Malden Road				
SAP Rating	85 B	DER	13.89	TER	17.08
Environmental	90 B	% DER<TER	18.68		
CO ₂ Emissions (t/year)	0.77	DFEE	30.84	TFEE	38.73
General Requirements Compliance	Fail	% DFEE<TFEE	20.39		
Assessor Details	Mr. Andy Love, Love Design Studio Ltd, Tel: 07563755762, Mail@lovedesignstudio.co.uk			Assessor ID	U860-0001
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 63 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
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.08 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.89 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)38.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)30.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.22 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.100

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
x x

Efficiency: 90%	
Minimum: 88%	OK

Secondary heating system:	None
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5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 1.82 kWh/day
Permitted by DBSCG 2.10	OK
Primary pipework insulated:	Yes OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
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Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK

Boiler interlock	Yes	OK
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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:	0.60
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 East:	2.02 m ² , No overhang	
Windows facing South:	8.30 m ² , No overhang	
Air change rate:	2.00 ach	
Blinds/curtains:	None	

10 Key features

External wall U-value	0.14 W/m ² K
External wall U-value	0.14 W/m ² K
Party wall U-value	0.00 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	62.9200 (1b)	x 2.7000 (2b)	= 169.8840 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.8840 (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:												75.6500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2700	0.2671	0.2642	0.2496	0.2467	0.2322	0.2322	0.2293	0.2380	0.2467	0.2525	0.2583 (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
windows (Uw = 1.20)			10.3200	1.1450	11.8168		(27)
Half glazed doors			6.2900	1.2000	7.5480		(26a)
Solid Door			2.0500	1.4000	2.8700		(26)
External Wall 1	28.7900	18.6600	10.1300	0.1400	1.4182		(29a)
Corridor	23.0600		23.0600	0.1342	3.0941		(29a)
Total net area of external elements Aum(A, m ²)			51.8500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	26.7471			(33)
Party Wall 1			43.8800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (User defined value 0.100 * total exposed area)							5.1850 (36)
Total fabric heat loss							(33) + (36) = 31.9321 (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	15.1349	14.9720	14.8091	13.9944	13.8315	13.0168	13.0168	12.8539	13.3427	13.8315	14.1573	14.4832 (38)
Heat transfer coeff	47.0670	46.9041	46.7412	45.9265	45.7636	44.9489	44.9489	44.7860	45.2748	45.7636	46.0894	46.4153 (39)
Average = Sum(39)m / 12 =												45.8858 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7480	0.7455	0.7429	0.7299	0.7273	0.7144	0.7144	0.7118	0.7196	0.7273	0.7325	0.7377 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0629 (42)
Average daily hot water use (litres/day)												83.1933 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	91.5126	88.1849	84.8572	81.5294	78.2017	74.8740	74.8740	78.2017	81.5294	84.8572	88.1849	91.5126 (44)
Energy content (annual)	135.7106	118.6934	122.4809	106.7818	102.4597	88.4149	81.9294	94.0152	95.1381	110.8742	121.0279	131.4285 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1308.9547 (45)
	20.3566	17.8040	18.3721	16.0173	15.3690	13.2622	12.2894	14.1023	14.2707	16.6311	18.1542	19.7143 (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

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 %)												89.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												723.7637 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	177.0385	103.2475	56.1791	14.8998	2.2924	0.0000	0.0000	0.0000	0.0000	14.3268	89.9442	189.8403 (98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000 (210)
Space heating fuel (main heating system)	197.8084	115.3603	62.7700	16.6478	2.5613	0.0000	0.0000	0.0000	0.0000	16.0075	100.4963	212.1121 (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												
Efficiency of water heater (217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000 (216)
Fuel for water heating, kWh/month	211.5860	186.7703	196.8042	177.3294	174.4342	156.8077	151.4953	164.9990	164.3196	183.8359	193.2468	206.8015 (219)
Water heating fuel used												2168.4299 (219)
Annual totals kWh/year												
Space heating fuel - main system												723.7637 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)												
mechanical ventilation fans (SFP = 0.7500)												155.4439 (230a)
central heating pump												30.0000 (230c)
Total electricity for the above, kWh/year												185.4439 (231)
Electricity for lighting (calculated in Appendix L)												294.6446 (232)
Total delivered energy for all uses												3372.2821 (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	723.7637	0.2160	156.3330 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2168.4299	0.2160	468.3809 (264)
Space and water heating			624.7138 (265)
Pumps and fans	185.4439	0.5190	96.2454 (267)
Energy for lighting	294.6446	0.5190	152.9205 (268)
Total CO2, kg/year			873.8797 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.8900 (273)

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

DER		13.8900 ZC1
Total Floor Area	TFA	62.9200
Assumed number of occupants	N	2.0629
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.9756 ZC2
CO2 emissions from cooking, equation (L16)		2.6781 ZC3
Total CO2 emissions		33.5437 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		33.5437 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	62.9200 (1b)	x 2.7000 (2b)	= 169.8840 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 169.8840 (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					0.3677 (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) =				0.2850 (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	0.3634	0.3562	0.3491	0.3135	0.3064	0.2707	0.2707	0.2636	0.2850	0.3064	0.3206	0.3349 (22b)
Effective ac	0.5660	0.5635	0.5609	0.5491	0.5469	0.5366	0.5366	0.5347	0.5406	0.5469	0.5514	0.5561 (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			2.0500	1.0000	2.0500		(26)
TER Semi-glazed door			6.2900	1.2000	7.5480		(26a)
TER Opening Type (Uw = 1.40)			7.3900	1.3258	9.7973		(27)
External Wall 1	28.7900	15.7300	13.0600	0.1800	2.3508		(29a)
Corridor	23.0600		23.0600	0.1800	4.1508		(29a)
Total net area of external elements Aum(A, m ²)			51.8500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	25.8969		(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)							4.1763 (36)
Total fabric heat loss						(33) + (36) =	30.0732 (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	31.7318	31.5881	31.4472	30.7856	30.6618	30.0855	30.0855	29.9788	30.3075	30.6618	30.9122	31.1740 (38)
Heat transfer coeff	61.8050	61.6613	61.5205	60.8588	60.7350	60.1588	60.1588	60.0520	60.3807	60.7350	60.9855	61.2473 (39)
Average = Sum(39)m / 12 =												60.8582 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9823	0.9800	0.9778	0.9672	0.9653	0.9561	0.9561	0.9544	0.9596	0.9653	0.9693	0.9734 (40)
HLP (average)												0.9672 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0629 (42)
Average daily hot water use (litres/day)												83.1933 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	91.5126	88.1849	84.8572	81.5294	78.2017	74.8740	74.8740	78.2017	81.5294	84.8572	88.1849	91.5126 (44)
Energy conte	135.7106	118.6934	122.4809	106.7818	102.4597	88.4149	81.9294	94.0152	95.1381	110.8742	121.0279	131.4285 (45)
Energy content (annual)										Total = Sum(45)m =		1308.9547 (45)
Distribution loss (46)m = 0.15 x (45)m	20.3566	17.8040	18.3721	16.0173	15.3690	13.2622	12.2894	14.1023	14.2707	16.6311	18.1542	19.7143 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8381 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (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	184.9533	163.1706	171.7236	154.4360	151.7024	136.0691	131.1721	143.2579	142.7923	160.1169	168.6821	180.6711 (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	184.9533	163.1706	171.7236	154.4360	151.7024	136.0691	131.1721	143.2579	142.7923	160.1169	168.6821	180.6711 (64)
Heat gains from water heating, kWh/month	84.5179	75.0473	80.1190	73.6283	73.4620	67.5213	66.6357	70.6542	69.7568	76.2598	78.3651	83.0941 (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	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438	103.1438 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.9210	15.9173	12.9448	9.8001	7.3257	6.1846	6.6827	8.6864	11.6589	14.8037	17.2781	18.4191 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.2466	182.1170	177.4037	167.3695	154.7032	142.7987	134.8458	132.9754	137.6887	147.7228	160.3891	172.2937 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144	33.3144 (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)	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150	-82.5150 (71)
Water heating gains (Table 5)	113.5993	111.6776	107.6869	102.2616	98.7392	93.7796	89.5641	94.9653	96.8844	102.4998	108.8405	111.6856 (72)
Total internal gains	368.7101	366.6550	354.9785	336.3743	317.7113	299.7061	288.0357	293.5703	303.1752	321.9694	343.4508	359.3415 (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
East					1.4500	19.6403	0.6300	0.7000			0.7700	8.7034 (76)
South					5.9400	46.7521	0.6300	0.7000			0.7700	84.8710 (78)
Solar gains	93.5743	156.0224	205.0960	241.0060	258.6460	251.9844	244.9205	232.3739	217.5674	170.1234	111.4531	80.4935 (83)
Total gains	462.2844	522.6774	560.0745	577.3803	576.3573	551.6905	532.9561	525.9442	520.7426	492.0928	454.9039	439.8351 (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	70.6972	70.8620	71.0242	71.7964	71.9427	72.6319	72.6319	72.7610	72.3649	71.9427	71.6473	71.3410
alpha	5.7131	5.7241	5.7349	5.7864	5.7962	5.8421	5.8421	5.8507	5.8243	5.7962	5.7765	5.7561
util living area	0.9944	0.9878	0.9730	0.9346	0.8441	0.6697	0.4924	0.5194	0.7443	0.9364	0.9871	0.9957 (86)
MIT	20.1186	20.2661	20.4652	20.6962	20.8790	20.9759	20.9965	20.9953	20.9551	20.7361	20.3847	20.0885 (87)
Th 2	20.0981	20.1000	20.1019	20.1107	20.1124	20.1201	20.1201	20.1215	20.1171	20.1124	20.1090	20.1055 (88)
util rest of house	0.9926	0.9841	0.9646	0.9137	0.7970	0.5892	0.3962	0.4233	0.6693	0.9119	0.9824	0.9943 (89)
MIT 2	18.9310	19.1459	19.4326	19.7608	19.9956	20.1041	20.1187	20.1195	20.0837	19.8206	19.3258	18.8929 (90)
Living area fraction	19.3027	19.4965	19.7557	20.0535	20.2721	20.3770	20.3934	20.3936	20.3564	20.1071	19.6572	0.3129 (91)
MIT	19.3027	19.4965	19.7557	20.0535	20.2721	20.3770	20.3934	20.3936	20.3564	20.1071	19.6572	19.2671 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3027	19.4965	19.7557	20.0535	20.2721	20.3770	20.3934	20.3936	20.3564	20.1071	19.6572	19.2671 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9905	0.9808	0.9605	0.9121	0.8062	0.6136	0.4265	0.4535	0.6909	0.9117	0.9794	0.9926 (94)
Useful gains	457.8969	512.6529	537.9789	526.6376	464.6707	338.5071	227.2859	238.4979	359.7560	448.6572	445.5129	436.5799 (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	927.2410	900.0387	815.4970	678.7899	520.6260	347.5343	228.2082	239.8227	377.7638	577.4113	765.8065	922.8179 (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	349.1920	260.3233	206.4735	109.5496	41.6307	0.0000	0.0000	0.0000	0.0000	95.7931	230.6113	361.7611 (98)
Space heating												1655.3346 (98)
Space heating per m2										(98) / (4) =		26.3086 (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												1770.4114 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	349.1920	260.3233	206.4735	109.5496	41.6307	0.0000	0.0000	0.0000	0.0000	95.7931	230.6113	361.7611 (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)	373.4674	278.4206	220.8272	117.1654	44.5249	0.0000	0.0000	0.0000	0.0000	102.4525	246.6432	386.9102 (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	184.9533	163.1706	171.7236	154.4360	151.7024	136.0691	131.1721	143.2579	142.7923	160.1169	168.6821	180.6711 (64)
Efficiency of water heater (217)m	86.4847	86.0542	85.3063	83.9173	81.8847	79.8000	79.8000	79.8000	79.8000	83.4953	85.6485	79.8000 (216)
Fuel for water heating, kWh/month	213.8567	189.6137	201.3023	184.0335	185.2634	170.5127	164.3761	179.5212	178.9377	191.7677	196.9470	208.5525 (219)
Water heating fuel used												2264.6844 (219)
Annual totals kWh/year												
Space heating fuel - main system												1770.4114 (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)												316.4908 (232)
Total delivered energy for all uses												4426.5866 (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	1770.4114	0.2160	382.4089 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2264.6844	0.2160	489.1718 (264)
Space and water heating			871.5807 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	316.4908	0.5190	164.2587 (268)
Total CO2, kg/m2/year			1074.7644 (272)
Emissions per m2 for space and water heating			13.8522 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.6106 (272b)
Emissions per m2 for pumps and fans			0.6186 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.8522 * 1.00) + 2.6106 + 0.6186, rounded to 2 d.p.			17.0800 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 8			Issued on Date	13/04/2022
Assessment Reference	Unit 8_Be Green	Prop Type Ref	160 Malden Road		
Property	160, Malden Road				
SAP Rating	88 B	DER	15.21	TER	27.81
Environmental	89 B	% DER<TER	45.32		
CO ₂ Emissions (t/year)	0.79	DFEE	44.31	TFEE	50.55
General Requirements Compliance	Fail	% DFEE<TFEE	12.36		
Assessor Details	Mr. Andy Love, Love Design Studio Ltd, Tel: 07563755762, Mail@lovedesignstudio.co.uk			Assessor ID	U860-0001
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 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
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 27.81 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.21 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 50.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 44.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.21 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified ψ -value of 0.100

3 Air permeability

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

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric
Air-to-water heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water storage: Nominal cylinder loss: 1.82 kWh/day
Permitted by DBSCG 2.10 OK
Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

Cylinderstat OK
Independent timer for DHW OK

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: 0.53
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: 7.92 m², No overhang
Windows facing East: 9.06 m², No overhang
Windows facing South: 8.01 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Roof U-value 0.12 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.68 kW

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	65.8900 (1b)	x 2.7000 (2b)	= 177.9030 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.8900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.9030 (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					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (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	0.2944	0.2909	0.2875	0.2701	0.2667	0.2493	0.2493	0.2458	0.2563	0.2667	0.2736	0.2805 (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
windows (Uw = 1.20)			24.9900	1.1450	28.6145		(27)
Half glazed doors			6.2900	1.2000	7.5480		(26a)
Solid Door			2.0500	1.4000	2.8700		(26)
External Wall 1	72.1900	33.3300	38.8600	0.1400	5.4404		(29a)
Corridor	4.0500		4.0500	0.1342	0.5434		(29a)
External Roof 1	5.2200		5.2200	0.1200	0.6264		(30)
Total net area of external elements Aum(A, m ²)			81.4600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	45.6427		(33)
Party Wall 1			19.6000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K	250.0000 (35)
Thermal bridges (User defined value 0.100 * total exposed area)	8.1460 (36)
Total fabric heat loss	(33) + (36) = 53.7887 (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	17.2840	17.0804	16.8767	15.8585	15.6549	14.6366	14.6366	14.4330	15.0439	15.6549	16.0621	16.4694 (38)
Average = Sum(39)m / 12 =	71.0727	70.8691	70.6654	69.6472	69.4436	68.4254	68.4254	68.2217	68.8326	69.4436	69.8509	70.2581 (39)
												69.5963 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0787	1.0756	1.0725	1.0570	1.0539	1.0385	1.0385	1.0354	1.0447	1.0539	1.0601	1.0663 (40)
Days in month												1.0562 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1424 (42)
Average daily hot water use (litres/day)												85.0813 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	93.5894	90.1862	86.7829	83.3797	79.9764	76.5732	76.5732	79.9764	83.3797	86.7829	90.1862	93.5894 (44)
Energy conte	138.7904	121.3870	125.2605	109.2051	104.7849	90.4214	83.7887	96.1488	97.2971	113.3904	123.7745	134.4111 (45)
Energy content (annual)										Total = Sum (45)m =		1338.6598 (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

	20.8186	18.2080	18.7891	16.3808	15.7177	13.5632	12.5683	14.4223	14.5946	17.0086	18.5662	20.1617 (46)
Water storage loss:												
Store volume												180.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0115 (51)
Volume factor from Table 2a												0.8736 (52)
Temperature factor from Table 2b												0.5400 (53)
Enter (49) or (54) in (55)												0.9805 (55)
Total storage loss												
30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965	(56)
If cylinder contains dedicated solar storage												
30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965	(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												
192.4493	169.8530	178.9194	161.1331	158.4438	142.3494	137.4476	149.8077	149.2251	167.0493	175.7024	188.0700	(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												
192.4493	169.8530	178.9194	161.1331	158.4438	142.3494	137.4476	149.8077	149.2251	167.0493	175.7024	188.0700	(64)
Heat gains from water heating, kWh/month												
89.0749	79.1340	84.5762	77.8531	77.7681	71.6075	70.7869	74.8966	73.8936	80.6294	82.6974	87.6188	(65)
Total per year (kWh/year) = Sum(64)m =												1970.4499 (64)

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

Metabolic gains (Table 5), Watts												
(66)m	107.1185	107.1185	107.1185	107.1185	107.1185	107.1185	107.1185	107.1185	107.1185	107.1185	107.1185	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
16.7177	14.8485	12.0756	9.1420	6.8338	5.7693	6.2340	8.1032	10.8760	13.8096	16.1179	17.1823	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
187.5213	189.4672	184.5636	174.1245	160.9470	148.5620	140.2881	138.3422	143.2458	153.6849	166.8624	179.2474	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
33.7118	33.7118	33.7118	33.7118	33.7118	33.7118	33.7118	33.7118	33.7118	33.7118	33.7118	33.7118	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-85.6948	-85.6948	-85.6948	-85.6948	-85.6948	-85.6948	-85.6948	-85.6948	-85.6948	-85.6948	-85.6948	-85.6948	(71)
Water heating gains (Table 5)												
119.7243	117.7590	113.6777	108.1293	104.5270	99.4548	95.1436	100.6674	102.6301	108.3729	114.8575	117.7672	(72)
Total internal gains	382.0989	380.2102	368.4525	349.5313	330.4433	311.9217	299.8012	305.2483	314.8874	334.0029	355.9733	372.3324 (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	7.9200				10.6334		0.6300		0.7000		0.7700		25.7376 (74)	
East	9.0600				19.6403		0.6300		0.7000		0.7700		54.3810 (76)	
South	8.0100				46.7521		0.6300		0.7000		0.7700		114.4472 (78)	
Solar gains	194.5659	343.0018	497.5320	659.6088	775.1830	784.7692	750.3384	662.3243	553.6588	386.9455	235.2164	165.0694	(83)	
Total gains	576.6647	723.2120	865.9844	1009.1401	1105.6263	1096.6910	1050.1396	967.5726	868.5463	720.9484	591.1897	537.4018	(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)												
tau	64.3805	64.5655	64.7515	65.6982	65.8908	66.8713	66.8713	Aug	Sep	Oct	Nov	Dec
alpha	5.2920	5.3044	5.3168	5.3799	5.3927	5.4581	5.4581	67.0709	66.4756	65.8908	65.5066	65.1269
util living area	0.9886	0.9654	0.9033	0.7587	0.5703	0.3977	0.2865	5.4714	5.4317	5.3927	5.3671	5.3418
MIT	20.1092	20.3602	20.6495	20.8882	20.9778	20.9974	20.9997	20.9993	20.9880	20.8353	20.4253	20.0630 (87)
Th 2	20.0183	20.0208	20.0234	20.0361	20.0386	20.0514	20.0514	20.0539	20.0463	20.0386	20.0335	20.0285 (88)
util rest of house	0.9852	0.9559	0.8801	0.7155	0.5160	0.3395	0.2248	0.2575	0.4670	0.8008	0.9619	0.9893 (89)
MIT 2	18.8570	19.2161	19.6136	19.9224	20.0204	20.0499	20.0513	20.0537	20.0385	19.8726	19.3231	18.7979 (90)
Living area fraction	19.3441	19.6611	20.0165	20.2981	20.3928	20.4185	20.4202	20.4215	20.4078	fLA = Living area / (4) =	19.7519	0.3890 (91)
MIT	19.3441	19.6611	20.0165	20.2981	20.3928	20.4185	20.4202	20.4215	20.4078	20.2471	19.7519	19.2900 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3441	19.6611	20.0165	20.2981	20.3928	20.4185	20.4202	20.4215	20.4078	20.2471	19.7519	19.2900 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9821	0.9517	0.8799	0.7278	0.5363	0.3621	0.2488	0.2833	0.4940	0.8110	0.9585	0.9867 (94)
Ext temp.	566.3301	688.2984	761.9618	734.4118	592.9532	397.1260	261.2980	274.1578	429.0998	584.7140	566.6729	530.2761 (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	1069.2259	1046.1072	955.1527	793.8425	603.6619	398.1327	261.3972	274.3568	434.1837	669.9291	883.7434	1060.1984 (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	374.1545	240.4476	143.7340	42.7901	7.9673	0.0000	0.0000	0.0000	0.0000	63.4001	228.2908	394.2622 (98)
Space heating per m2												1495.0465 (98)
												(98) / (4) = 22.6900 (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

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 %)																175.1000	(206)
Efficiency of secondary/supplementary heating system, %																0.0000	(208)
Space heating requirement																853.8244	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Space heating requirement	374.1545	240.4476	143.7340	42.7901	7.9673	0.0000	0.0000	0.0000	0.0000	63.4001	228.2908	394.2622	(98)				
Space heating efficiency (main heating system 1)	175.1000	175.1000	175.1000	175.1000	175.1000	0.0000	0.0000	0.0000	0.0000	175.1000	175.1000	175.1000	(210)				
Space heating fuel (main heating system)	213.6804	137.3201	82.0868	24.4375	4.5502	0.0000	0.0000	0.0000	0.0000	36.2079	130.3774	225.1640	(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	192.4493	169.8530	178.9194	161.1331	158.4438	142.3494	137.4476	149.8077	149.2251	167.0493	175.7024	188.0700	(64)				
Efficiency of water heater (217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)				
Fuel for water heating, kWh/month	109.9082	97.0035	102.1812	92.0235	90.4876	81.2960	78.4966	85.5555	85.2228	95.4022	100.3441	107.4072	(219)				
Water heating fuel used												1125.3283	(219)				
Annual totals kWh/year																	
Space heating fuel - main system													853.8244	(211)			
Space heating fuel - secondary													0.0000	(215)			
Electricity for pumps and fans:																	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6625)																	
mechanical ventilation fans (SFP = 0.6625)													143.7901	(230a)			
central heating pump													30.0000	(230c)			
Total electricity for the above, kWh/year													173.7901	(231)			
Electricity for lighting (calculated in Appendix L)													295.2391	(232)			
Energy saving/generation technologies (Appendices M ,N and Q)																	
PV Unit 0 (0.80 * 0.68 * 951 * 1.00) =													-517.1351	(233)			
Total delivered energy for all uses													1931.0468	(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	853.8244	0.5190	443.1349	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1125.3283	0.5190	584.0454	(264)
Space and water heating			1027.1803	(265)
Pumps and fans	173.7901	0.5190	90.1971	(267)
Energy for lighting	295.2391	0.5190	153.2291	(268)
Energy saving/generation technologies				
PV Unit	-517.1351	0.5190	-268.3931	(269)
Total CO2, kg/year			1002.2133	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			15.2100	(273)

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

DER			15.2100	ZC1
Total Floor Area		TFA	65.8900	
Assumed number of occupants		N	2.1424	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.8647	ZC2
CO2 emissions from cooking, equation (L16)			2.5864	ZC3
Total CO2 emissions			34.6610	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			34.6610	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	65.8900 (1b)	x 2.7000 (2b)	= 177.9030 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.8900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.9030 (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)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.1124 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3624 (18)
Number of sides sheltered					1 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3352 (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												
	0.4274	0.4190	0.4107	0.3688	0.3604	0.3185	0.3185	0.3101	0.3352	0.3604	0.3771	0.3939 (22b)
Effective ac	0.5913	0.5878	0.5843	0.5680	0.5649	0.5507	0.5507	0.5481	0.5562	0.5649	0.5711	0.5776 (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			2.0500	1.0000	2.0500			(26)					
TER Semi-glazed door			6.2900	1.2000	7.5480			(26a)					
TER Opening Type (Uw = 1.40)			8.1400	1.3258	10.7917			(27)					
External Wall 1	72.1900	16.4800	55.7100	0.1800	10.0278			(29a)					
Corridor	4.0500		4.0500	0.1800	0.7290			(29a)					
External Roof 1	5.2200		5.2200	0.1300	0.6786			(30)					
Total net area of external elements Aum(A, m2)			81.4600					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.8251			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								6.2073 (36)					
Total fabric heat loss						(33) + (36) =		38.0324 (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	34.7169	34.5086	34.3045	33.3457	33.1664	32.3313	32.3313	32.1767	32.6530	33.1664	33.5292	33.9086	(38)
Heat transfer coeff	72.7492	72.5410	72.3369	71.3781	71.1987	70.3637	70.3637	70.2090	70.6853	71.1987	71.5616	71.9410	(39)
Average = Sum(39)m / 12 =												71.3772	(39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1041	1.1009	1.0978	1.0833	1.0806	1.0679	1.0679	1.0655	1.0728	1.0806	1.0861	1.0918	(40)
HLP (average)												1.0833	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1424 (42)
Average daily hot water use (litres/day)												85.0813 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	93.5894	90.1862	86.7829	83.3797	79.9764	76.5732	76.5732	79.9764	83.3797	86.7829	90.1862	93.5894 (44)
Energy conte	138.7904	121.3870	125.2605	109.2051	104.7849	90.4214	83.7887	96.1488	97.2971	113.3904	123.7745	134.4111 (45)
Energy content (annual)										Total = Sum(45)m =		1338.6598 (45)
Distribution loss (46)m = 0.15 x (45)m												
	20.8186	18.2080	18.7891	16.3808	15.7177	13.5632	12.5683	14.4223	14.5946	17.0086	18.5662	20.1617 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (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)												0.8381 (55)
Total storage loss												
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(56)
If cylinder contains dedicated solar storage												
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(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												
188.0331	165.8642	174.5031	156.8593	154.0276	138.0756	133.0314	145.3915	144.9513	162.6331	171.4287	183.6538	(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												
188.0331	165.8642	174.5031	156.8593	154.0276	138.0756	133.0314	145.3915	144.9513	162.6331	171.4287	183.6538	(64)
Heat gains from water heating, kWh/month												
85.5419	75.9430	81.0432	74.4341	74.2351	68.1885	67.2539	71.3636	70.4746	77.0964	79.2784	84.0858	(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	107.1185	107.1185	107.1185	107.1185	107.1185	107.1185	107.1185	107.1185	107.1185	107.1185	107.1185	107.1185	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4368	16.3754	13.3174	10.0821	7.5365	6.3626	6.8751	8.9365	11.9945	15.2298	17.7754	18.9493	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	187.5213	189.4672	184.5636	174.1245	160.9470	148.5620	140.2881	138.3422	143.2458	153.6849	166.8624	179.2474	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.7118	33.7118	33.7118	33.7118	33.7118	33.7118	33.7118	33.7118	33.7118	33.7118	33.7118	33.7118	(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)	-85.6948	-85.6948	-85.6948	-85.6948	-85.6948	-85.6948	-85.6948	-85.6948	-85.6948	-85.6948	-85.6948	-85.6948	(71)
Water heating gains (Table 5)	114.9757	113.0104	108.9291	103.3806	99.7784	94.7062	90.3950	95.9188	97.8815	103.6243	110.1089	113.0186	(72)
Total internal gains	379.0694	376.9885	364.9457	345.7228	326.3974	307.7664	295.6937	301.3330	311.2573	330.6744	352.8822	369.3507	(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				2.5800	10.6334	0.6300	0.7000	0.7700	8.3842 (74)			
East				2.9500	19.6403	0.6300	0.7000	0.7700	17.7068 (76)			
South				2.6100	46.7521	0.6300	0.7000	0.7700	37.2918 (78)			
Solar gains	63.3829	111.7354	162.0688	214.8571	252.4985	255.6193	244.4050	215.7396	180.3491	126.0486	76.6249	53.7743 (83)
Total gains	442.4523	488.7239	527.0144	560.5799	578.8960	563.3857	540.0987	517.0726	491.6064	456.7231	429.5070	423.1250 (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	62.8968	63.0774	63.2554	64.1050	64.2665	65.0292	65.0292	65.1724	64.7333	64.2665	63.9406	63.6034
alpha	5.1931	5.2052	5.2170	5.2737	5.2844	5.3353	5.3353	5.3448	5.3156	5.2844	5.2627	5.2402
util living area	0.9966	0.9937	0.9861	0.9615	0.8916	0.7353	0.5603	0.6046	0.8383	0.9687	0.9931	0.9973 (86)
MIT	19.8876	20.0188	20.2385	20.5316	20.7892	20.9478	20.9899	20.9851	20.8907	20.5697	20.1806	19.8668 (87)
Th 2	19.9975	20.0001	20.0026	20.0145	20.0167	20.0271	20.0271	20.0291	20.0231	20.0167	20.0122	20.0075 (88)
util rest of house	0.9955	0.9916	0.9812	0.9470	0.8502	0.6478	0.4431	0.4870	0.7672	0.9539	0.9904	0.9965 (89)
MIT 2	18.5207	18.7136	19.0338	19.4598	19.8054	19.9913	20.0233	20.0228	19.9352	19.5203	18.9590	18.4976 (90)
Living area fraction									fLA = Living area / (4) =			0.3890 (91)
MIT	19.0524	19.2213	19.5024	19.8767	20.1881	20.3634	20.3993	20.3971	20.3069	19.9285	19.4342	19.0302 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0524	19.2213	19.5024	19.8767	20.1881	20.3634	20.3993	20.3971	20.3069	19.9285	19.4342	19.0302 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9941	0.9894	0.9780	0.9445	0.8584	0.6799	0.4890	0.5331	0.7902	0.9523	0.9883	0.9952	(94)	
Useful gains	439.8316	483.5676	515.4113	529.4871	496.9205	383.0688	264.1251	275.6330	388.4567	434.9336	424.4728	421.1128	(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	1073.2228	1038.8803	940.5538	783.4973	604.3417	405.5328	267.3308	280.6309	438.7361	664.1800	882.6557	1066.9010	(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	471.2431	373.1701	316.3060	182.8873	79.9214	0.0000	0.0000	0.0000	0.0000	170.5594	329.8917	480.4664	(98)	
Space heating												2404.4453	(98)	
Space heating per m2												(98) / (4) =	36.4918	(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													2571.5993 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	471.2431	373.1701	316.3060	182.8873	79.9214	0.0000	0.0000	0.0000	0.0000	170.5594	329.8917	480.4664	(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)	504.0033	399.1124	338.2951	195.6014	85.4774	0.0000	0.0000	0.0000	0.0000	182.4164	352.8253	513.8678	(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	188.0331	165.8642	174.5031	156.8593	154.0276	138.0756	133.0314	145.3915	144.9513	162.6331	171.4287	183.6538	(64)
Efficiency of water heater (217)m	87.1665	86.9140	86.3819	85.2241	83.1588	79.8000	79.8000	79.8000	79.8000	84.9408	86.5324	79.8000	(216)
Fuel for water heating, kWh/month	215.7171	190.8371	202.0135	184.0552	185.2210	173.0271	166.7060	182.1948	181.6432	191.4663	198.1092	210.4570	(219)
Water heating fuel used												2281.4475	(219)
Annual totals kWh/year													
Space heating fuel - main system												2571.5993	(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)												325.6003	(232)
Total delivered energy for all uses												5253.6471	(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	2571.5993	0.2160	555.4654	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2281.4475	0.2160	492.7927	(264)
Space and water heating			1048.2581	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	325.6003	0.5190	168.9866	(268)
Total CO2, kg/m2/year			1256.1697	(272)
Emissions per m2 for space and water heating			15.9092	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.5647	(272b)
Emissions per m2 for pumps and fans			0.5908	(272c)
Target Carbon Dioxide Emission Rate (TER) = (15.9092 * 1.55) + 2.5647 + 0.5908, rounded to 2 d.p.			27.8100	(273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 8			Issued on Date	13/04/2022
Assessment Reference	Unit 8_Be Lean	Prop Type Ref	160 Malden Road		
Property	160, Malden Road				
SAP Rating	84 B	DER	16.24	TER	19.06
Environmental	88 B	% DER<TER	14.82		
CO ₂ Emissions (t/year)	0.91	DFEE	44.31	TFEE	50.55
General Requirements Compliance	Fail	% DFEE<TFEE	12.36		
Assessor Details	Mr. Andy Love, Love Design Studio Ltd, Tel: 07563755762, Mail@lovedesignstudio.co.uk			Assessor ID	U860-0001
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 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
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 19.06 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.24 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 50.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 44.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.21 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.100

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
x x

Efficiency: 90%
Minimum: 88% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage: Nominal cylinder loss: 1.82 kWh/day
Permitted by DBSCG 2.10 OK
Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK
Independent timer for DHW OK

Boiler interlock: Yes OK

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: 0.53
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: 7.92 m², No overhang
Windows facing East: 9.06 m², No overhang
Windows facing South: 8.01 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Roof U-value 0.12 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	65.8900 (1b)	x 2.7000 (2b)	= 177.9030 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.8900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.9030 (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							1	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.9250 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1388 (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)
	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (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	0.2944	0.2909	0.2875	0.2701	0.2667	0.2493	0.2493	0.2458	0.2563	0.2667	0.2736	0.2805 (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					
windows (Uw = 1.20)			24.9900	1.1450	28.6145		(27)					
Half glazed doors			6.2900	1.2000	7.5480		(26a)					
Solid Door			2.0500	1.4000	2.8700		(26)					
External Wall 1	72.1900	33.3300	38.8600	0.1400	5.4404		(29a)					
Corridor	4.0500		4.0500	0.1342	0.5434		(29a)					
External Roof 1	5.2200		5.2200	0.1200	0.6264		(30)					
Total net area of external elements Aum(A, m2)			81.4600				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		45.6427		(33)					
Party Wall 1			19.6000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (User defined value 0.100 * total exposed area)							8.1460 (36)					
Total fabric heat loss							(33) + (36) = 53.7887 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 17.2840	Feb 17.0804	Mar 16.8767	Apr 15.8585	May 15.6549	Jun 14.6366	Jul 14.6366	Aug 14.4330	Sep 15.0439	Oct 15.6549	Nov 16.0621	Dec 16.4694 (38)
Heat transfer coeff	71.0727	70.8691	70.6654	69.6472	69.4436	68.4254	68.4254	68.2217	68.8326	69.4436	69.8509	70.2581 (39)
Average = Sum(39)m / 12 =												69.5963 (39)
HLP	Jan 1.0787	Feb 1.0756	Mar 1.0725	Apr 1.0570	May 1.0539	Jun 1.0385	Jul 1.0385	Aug 1.0354	Sep 1.0447	Oct 1.0539	Nov 1.0601	Dec 1.0663 (40)
HLP (average)												1.0562 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1424 (42)
Average daily hot water use (litres/day)												85.0813 (43)
Daily hot water use	Jan 93.5894	Feb 90.1862	Mar 86.7829	Apr 83.3797	May 79.9764	Jun 76.5732	Jul 76.5732	Aug 79.9764	Sep 83.3797	Oct 86.7829	Nov 90.1862	Dec 93.5894 (44)
Energy conte	138.7904	121.3870	125.2605	109.2051	104.7849	90.4214	83.7887	96.1488	97.2971	113.3904	123.7745	134.4111 (45)
Energy content (annual)												Total = Sum(45)m = 1338.6598 (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

	20.8186	18.2080	18.7891	16.3808	15.7177	13.5632	12.5683	14.4223	14.5946	17.0086	18.5662	20.1617 (46)
Water storage loss:												
Store volume												180.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0115 (51)
Volume factor from Table 2a												0.8736 (52)
Temperature factor from Table 2b												0.5400 (53)
Enter (49) or (54) in (55)												0.9805 (55)
Total storage loss												
	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (56)
If cylinder contains dedicated solar storage												
	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (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												
	192.4493	169.8530	178.9194	161.1331	158.4438	142.3494	137.4476	149.8077	149.2251	167.0493	175.7024	188.0700 (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												
	192.4493	169.8530	178.9194	161.1331	158.4438	142.3494	137.4476	149.8077	149.2251	167.0493	175.7024	188.0700 (64)
Heat gains from water heating, kWh/month												
	89.0749	79.1340	84.5762	77.8531	77.7681	71.6075	70.7869	74.8966	73.8936	80.6294	82.6974	87.6188 (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	107.1185	107.1185	107.1185	107.1185	107.1185	107.1185	107.1185	107.1185	107.1185	107.1185	107.1185	107.1185 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	16.7177	14.8485	12.0756	9.1420	6.8338	5.7693	6.2340	8.1032	10.8760	13.8096	16.1179	17.1823 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	187.5213	189.4672	184.5636	174.1245	160.9470	148.5620	140.2881	138.3422	143.2458	153.6849	166.8624	179.2474 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	33.7118	33.7118	33.7118	33.7118	33.7118	33.7118	33.7118	33.7118	33.7118	33.7118	33.7118	33.7118 (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)												
	-85.6948	-85.6948	-85.6948	-85.6948	-85.6948	-85.6948	-85.6948	-85.6948	-85.6948	-85.6948	-85.6948	-85.6948 (71)
Water heating gains (Table 5)												
	119.7243	117.7590	113.6777	108.1293	104.5270	99.4548	95.1436	100.6674	102.6301	108.3729	114.8575	117.7672 (72)
Total internal gains												
	382.0989	380.2102	368.4525	349.5313	330.4433	311.9217	299.8012	305.2483	314.8874	334.0029	355.9733	372.3324 (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	7.9200	10.6334	0.6300	0.7000	0.7700	25.7376 (74)
East	9.0600	19.6403	0.6300	0.7000	0.7700	54.3810 (76)
South	8.0100	46.7521	0.6300	0.7000	0.7700	114.4472 (78)

Solar gains	194.5659	343.0018	497.5320	659.6088	775.1830	784.7692	750.3384	662.3243	553.6588	386.9455	235.2164	165.0694 (83)
Total gains	576.6647	723.2120	865.9844	1009.1401	1105.6263	1096.6910	1050.1396	967.5726	868.5463	720.9484	591.1897	537.4018 (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	64.3805	64.5655	64.7515	65.6982	65.8908	66.8713	66.8713	67.0709	66.4756	65.8908	65.5066	65.1269
alpha	5.2920	5.3044	5.3168	5.3799	5.3927	5.4581	5.4581	5.4714	5.4317	5.3927	5.3671	5.3418
util living area												
	0.9886	0.9654	0.9033	0.7587	0.5703	0.3977	0.2865	0.3239	0.5373	0.8443	0.9715	0.9918 (86)
MIT	20.1092	20.3602	20.6495	20.8882	20.9778	20.9974	20.9997	20.9993	20.9880	20.8353	20.4253	20.0630 (87)
Th 2	20.0183	20.0208	20.0234	20.0361	20.0386	20.0514	20.0514	20.0539	20.0463	20.0386	20.0335	20.0285 (88)
util rest of house												
	0.9852	0.9559	0.8801	0.7155	0.5160	0.3395	0.2248	0.2575	0.4670	0.8008	0.9619	0.9893 (89)
MIT 2	18.8570	19.2161	19.6136	19.9224	20.0204	20.0499	20.0513	20.0537	20.0385	19.8726	19.3231	18.7979 (90)
Living area fraction												
	19.3441	19.6611	20.0165	20.2981	20.3928	20.4185	20.4202	20.4215	20.4078	20.2471	19.7519	19.2900 (91)
MIT												
Temperature adjustment												-0.1500
adjusted MIT	19.1941	19.5111	19.8665	20.1481	20.2428	20.2685	20.2702	20.2715	20.2578	20.0971	19.6019	19.1400 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9813	0.9498	0.8759	0.7208	0.5277	0.3529	0.2391	0.2728	0.4829	0.8037	0.9566	0.9861 (94)
Useful gains	565.8810	686.9413	758.4728	727.3842	583.4874	387.0061	251.0558	263.9657	419.4079	579.4311	565.5162	529.9565 (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												
	1058.5650	1035.4769	944.5529	783.3954	593.2454	387.8689	251.1334	264.1235	423.8588	659.5126	873.2658	1049.6597 (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												
	366.5568	234.2159	138.4436	40.3281	7.2599	0.0000	0.0000	0.0000	0.0000	59.5806	221.5797	386.6592 (98)
Space heating												1454.6239 (98)
Space heating per m2												22.0765 (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

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 %)														89.5000 (206)
Efficiency of secondary/supplementary heating system, %														0.0000 (208)
Space heating requirement														1625.2781 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	366.5568	234.2159	138.4436	40.3281	7.2599	0.0000	0.0000	0.0000	0.0000	59.5806	221.5797	386.6592	(98)	
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)	
Space heating fuel (main heating system)	409.5607	261.6938	154.6856	45.0593	8.1117	0.0000	0.0000	0.0000	0.0000	66.5705	247.5751	432.0214	(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	192.4493	169.8530	178.9194	161.1331	158.4438	142.3494	137.4476	149.8077	149.2251	167.0493	175.7024	188.0700	(64)	
Efficiency of water heater (217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(216)	
Fuel for water heating, kWh/month	215.0271	189.7799	199.9099	180.0369	177.0322	159.0496	153.5727	167.3829	166.7319	186.6472	196.3156	210.1340	(219)	
Water heating fuel used												2201.6200	(219)	
Annual totals kWh/year														
Space heating fuel - main system												1625.2781	(211)	
Space heating fuel - secondary												0.0000	(215)	
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6625)														
mechanical ventilation fans (SFP = 0.6625)													143.7901	(230a)
central heating pump													30.0000	(230c)
Total electricity for the above, kWh/year													173.7901	(231)
Electricity for lighting (calculated in Appendix L)													295.2391	(232)
Total delivered energy for all uses													4295.9273	(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	1625.2781	0.2160	351.0601	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2201.6200	0.2160	475.5499	(264)
Space and water heating			826.6100	(265)
Pumps and fans	173.7901	0.5190	90.1971	(267)
Energy for lighting	295.2391	0.5190	153.2291	(268)
Total CO2, kg/year			1070.0361	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			16.2400	(273)

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

DER			16.2400	ZC1
Total Floor Area		TFA	65.8900	
Assumed number of occupants		N	2.1424	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.8647	ZC2
CO2 emissions from cooking, equation (L16)			2.5864	ZC3
Total CO2 emissions			35.6910	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			35.6910	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	65.8900 (1b)	x 2.7000 (2b)	= 177.9030 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.8900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 177.9030 (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)
					Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.1124 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3624 (18)
Number of sides sheltered					1 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3352 (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	0.4274	0.4190	0.4107	0.3688	0.3604	0.3185	0.3185	0.3101	0.3352	0.3604	0.3771	0.3939 (22b)
	0.5913	0.5878	0.5843	0.5680	0.5649	0.5507	0.5507	0.5481	0.5562	0.5649	0.5711	0.5776 (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			2.0500	1.0000	2.0500		(26)
TER Semi-glazed door			6.2900	1.2000	7.5480		(26a)
TER Opening Type (Uw = 1.40)			8.1400	1.3258	10.7917		(27)
External Wall 1	72.1900	16.4800	55.7100	0.1800	10.0278		(29a)
Corridor	4.0500		4.0500	0.1800	0.7290		(29a)
External Roof 1	5.2200		5.2200	0.1300	0.6786		(30)
Total net area of external elements Aum(A, m ²)			81.4600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.8251		(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)							6.2073 (36)
Total fabric heat loss						(33) + (36) =	38.0324 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	34.7169	34.5086	34.3045	33.3457	33.1664	32.3313	32.3313
Heat transfer coeff	72.7492	72.5410	72.3369	71.3781	71.1987	70.3637	70.3637
Average = Sum(39)m / 12 =							71.3772 (39)
HLP	1.1041	1.1009	1.0978	1.0833	1.0806	1.0679	1.0679
HLP (average)							1.0833 (40)
Days in month	31	28	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1424 (42)
Average daily hot water use (litres/day)												85.0813 (43)
Daily hot water use	93.5894	90.1862	86.7829	83.3797	79.9764	76.5732	76.5732	79.9764	83.3797	86.7829	90.1862	93.5894 (44)
Energy conte	138.7904	121.3870	125.2605	109.2051	104.7849	90.4214	83.7887	96.1488	97.2971	113.3904	123.7745	134.4111 (45)
Energy content (annual)												Total = Sum(45)m = 1338.6598 (45)
Distribution loss (46)m = 0.15 x (45)m												
	20.8186	18.2080	18.7891	16.3808	15.7177	13.5632	12.5683	14.4223	14.5946	17.0086	18.5662	20.1617 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (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)												0.8381 (55)
Total storage loss												
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(56)
If cylinder contains dedicated solar storage												
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(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												
188.0331	165.8642	174.5031	156.8593	154.0276	138.0756	133.0314	145.3915	144.9513	162.6331	171.4287	183.6538	(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												
188.0331	165.8642	174.5031	156.8593	154.0276	138.0756	133.0314	145.3915	144.9513	162.6331	171.4287	183.6538	(64)
Heat gains from water heating, kWh/month												
85.5419	75.9430	81.0432	74.4341	74.2351	68.1885	67.2539	71.3636	70.4746	77.0964	79.2784	84.0858	(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	107.1185	107.1185	107.1185	107.1185	107.1185	107.1185	107.1185	107.1185	107.1185	107.1185	107.1185	107.1185	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.4368	16.3754	13.3174	10.0821	7.5365	6.3626	6.8751	8.9365	11.9945	15.2298	17.7754	18.9493	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	187.5213	189.4672	184.5636	174.1245	160.9470	148.5620	140.2881	138.3422	143.2458	153.6849	166.8624	179.2474	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.7118	33.7118	33.7118	33.7118	33.7118	33.7118	33.7118	33.7118	33.7118	33.7118	33.7118	33.7118	(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)	-85.6948	-85.6948	-85.6948	-85.6948	-85.6948	-85.6948	-85.6948	-85.6948	-85.6948	-85.6948	-85.6948	-85.6948	(71)
Water heating gains (Table 5)	114.9757	113.0104	108.9291	103.3806	99.7784	94.7062	90.3950	95.9188	97.8815	103.6243	110.1089	113.0186	(72)
Total internal gains	379.0694	376.9885	364.9457	345.7228	326.3974	307.7664	295.6937	301.3330	311.2573	330.6744	352.8822	369.3507	(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				2.5800	10.6334	0.6300	0.7000	0.7700	8.3842 (74)			
East				2.9500	19.6403	0.6300	0.7000	0.7700	17.7068 (76)			
South				2.6100	46.7521	0.6300	0.7000	0.7700	37.2918 (78)			
Solar gains	63.3829	111.7354	162.0688	214.8571	252.4985	255.6193	244.4050	215.7396	180.3491	126.0486	76.6249	53.7743 (83)
Total gains	442.4523	488.7239	527.0144	560.5799	578.8960	563.3857	540.0987	517.0726	491.6064	456.7231	429.5070	423.1250 (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	62.8968	63.0774	63.2554	64.1050	64.2665	65.0292	65.0292	65.1724	64.7333	64.2665	63.9406	63.6034
alpha	5.1931	5.2052	5.2170	5.2737	5.2844	5.3353	5.3353	5.3448	5.3156	5.2844	5.2627	5.2402
util living area	0.9966	0.9937	0.9861	0.9615	0.8916	0.7353	0.5603	0.6046	0.8383	0.9687	0.9931	0.9973 (86)
MIT	19.8876	20.0188	20.2385	20.5316	20.7892	20.9478	20.9899	20.9851	20.8907	20.5697	20.1806	19.8668 (87)
Th 2	19.9975	20.0001	20.0026	20.0145	20.0167	20.0271	20.0271	20.0291	20.0231	20.0167	20.0122	20.0075 (88)
util rest of house	0.9955	0.9916	0.9812	0.9470	0.8502	0.6478	0.4431	0.4870	0.7672	0.9539	0.9904	0.9965 (89)
MIT 2	18.5207	18.7136	19.0338	19.4598	19.8054	19.9913	20.0233	20.0228	19.9352	19.5203	18.9590	18.4976 (90)
Living area fraction	19.0524	19.2213	19.5024	19.8767	20.1881	20.3634	20.3993	20.3971	20.3069	19.9285	19.4342	19.0302 (91)
MIT	19.0524	19.2213	19.5024	19.8767	20.1881	20.3634	20.3993	20.3971	20.3069	19.9285	19.4342	19.0302 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0524	19.2213	19.5024	19.8767	20.1881	20.3634	20.3993	20.3971	20.3069	19.9285	19.4342	19.0302 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9941	0.9894	0.9780	0.9445	0.8584	0.6799	0.4890	0.5331	0.7902	0.9523	0.9883	0.9952	(94)	
Useful gains	439.8316	483.5676	515.4113	529.4871	496.9205	383.0688	264.1251	275.6330	388.4567	434.9336	424.4728	421.1128	(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	1073.2228	1038.8803	940.5538	783.4973	604.3417	405.5328	267.3308	280.6309	438.7361	664.1800	882.6557	1066.9010	(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	471.2431	373.1701	316.3060	182.8873	79.9214	0.0000	0.0000	0.0000	0.0000	170.5594	329.8917	480.4664	(98)	
Space heating												2404.4453	(98)	
Space heating per m2												(98) / (4) =	36.4918	(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													2571.5993 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	471.2431	373.1701	316.3060	182.8873	79.9214	0.0000	0.0000	0.0000	0.0000	170.5594	329.8917	480.4664	(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)	504.0033	399.1124	338.2951	195.6014	85.4774	0.0000	0.0000	0.0000	0.0000	182.4164	352.8253	513.8678	(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	188.0331	165.8642	174.5031	156.8593	154.0276	138.0756	133.0314	145.3915	144.9513	162.6331	171.4287	183.6538	(64)
Efficiency of water heater (217)m	87.1665	86.9140	86.3819	85.2241	83.1588	79.8000	79.8000	79.8000	79.8000	84.9408	86.5324	79.8000	(216)
Fuel for water heating, kWh/month	215.7171	190.8371	202.0135	184.0552	185.2210	173.0271	166.7060	182.1948	181.6432	191.4663	198.1092	210.4570	(219)
Water heating fuel used												2281.4475	(219)
Annual totals kWh/year													
Space heating fuel - main system												2571.5993	(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)												325.6003	(232)
Total delivered energy for all uses												5253.6471	(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	2571.5993	0.2160	555.4654 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2281.4475	0.2160	492.7927 (264)
Space and water heating			1048.2581 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	325.6003	0.5190	168.9866 (268)
Total CO2, kg/m2/year			1256.1697 (272)
Emissions per m2 for space and water heating			15.9092 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.5647 (272b)
Emissions per m2 for pumps and fans			0.5908 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.9092 * 1.00) + 2.5647 + 0.5908, rounded to 2 d.p.			19.0600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 9			Issued on Date	13/04/2022
Assessment Reference	Unit 9_Be Green	Prop Type Ref	160 Malden Road		
Property	160, Malden Road				
SAP Rating	89 B	DER	13.52	TER	25.65
Environmental	90 B	% DER<TER	47.29		
CO ₂ Emissions (t/year)	0.78	DFEE	38.93	TFEE	46.86
General Requirements Compliance	Pass	% DFEE<TFEE	16.93		
Assessor Details	Mr. Andy Love, Love Design Studio Ltd, Tel: 07563755762, Mail@lovedesignstudio.co.uk			Assessor ID	U860-0001
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 76 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

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 25.65 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 13.52 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)46.9 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)38.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.22 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.100

3 Air permeability

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

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric

Air-to-water heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 1.82 kWh/day	
Permitted by DBSCG 2.10	OK	
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
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Hot water controls:

Cylinderstat	OK
Independent timer for DHW	OK

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:	0.60
Maximum	1.5 OK
MVHR efficiency:	89%
Minimum:	70% OK

9 Summertime temperature

Overheating risk (Thames Valley):	Medium	OK
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Based on:

Overshading:	Average
Windows facing North:	11.88 m ² , No overhang
Windows facing South:	2.02 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

External wall U-value	0.14 W/m ² K
External wall U-value	0.14 W/m ² K
Party wall U-value	0.00 W/m ² K
Roof U-value	0.12 W/m ² K
Floor U-value	0.00 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	0.68 kW

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	75.7900 (1b)	x 2.7000 (2b)	= 204.6330 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	75.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.6330 (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
windows (Uw = 1.20)			13.9000	1.1450	15.9160		(27)
Half glazed doors			6.2900	1.2000	7.5480		(26a)
Solid Door			2.0500	1.4000	2.8700		(26)
Heat Loss Floor 1			5.0500	0.0000	0.0000		(28a)
External Wall 1	50.4300	20.1900	30.2400	0.1400	4.2336		(29a)
Corridor	4.0500	2.0500	2.0000	0.1342	0.2684		(29a)
External Roof 1	9.3300		9.3300	0.1200	1.1196		(30)
Total net area of external elements Aum(A, m2)			63.8100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.9556		(33)
Party Wall 1			51.4800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (User defined value 0.100 * total exposed area)							6.3810 (36)
Total fabric heat loss							(33) + (36) = 38.3366 (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	19.1993	18.9841	18.7688	17.6926	17.4773	16.4011	16.4011	16.1858	16.8316	17.4773	17.9078	18.3383 (38)
Heat transfer coeff	57.5359	57.3206	57.1054	56.0292	55.8139	54.7377	54.7377	54.5224	55.1682	55.8139	56.2444	56.6749 (39)
Average = Sum(39)m / 12 =												55.9753 (39)
HLP	0.7591	0.7563	0.7535	0.7393	0.7364	0.7222	0.7222	0.7194	0.7279	0.7364	0.7421	0.7478 (40)
HLP (average)												0.7386 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3781 (42)
Average daily hot water use (litres/day)												90.6806 (43)
Daily hot water use	99.7487	96.1215	92.4942	88.8670	85.2398	81.6126	81.6126	85.2398	88.8670	92.4942	96.1215	99.7487 (44)
Energy conte	147.9244	129.3756	133.5041	116.3921	111.6810	96.3722	89.3030	102.4765	103.7004	120.8528	131.9203	143.2569 (45)
Energy content (annual)												Total = Sum(45)m = 1426.7593 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	22.1887	19.4063	20.0256	17.4588	16.7521	14.4558	13.3955	15.3715	15.5551	18.1279	19.7880	21.4885 (46)
Water storage loss:												
Store volume												180.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0115 (51)
Volume factor from Table 2a												0.8736 (52)
Temperature factor from Table 2b												0.5400 (53)
Enter (49) or (54) in (55)												0.9805 (55)
Total storage loss	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (56)
If cylinder contains dedicated solar storage	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (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	201.5833	177.8417	187.1630	168.3200	165.3399	148.3001	142.9619	156.1354	155.6283	174.5117	183.8482	196.9158 (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	201.5833	177.8417	187.1630	168.3200	165.3399	148.3001	142.9619	156.1354	155.6283	174.5117	183.8482	196.9158 (64)
Total per year (kWh/year) = Sum(64)m =												2058.5494 (64)
Heat gains from water heating, kWh/month	92.1120	81.7903	87.3172	80.2427	80.0610	73.5861	72.6204	77.0005	76.0227	83.1107	85.4059	90.5600 (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	118.9066	118.9066	118.9066	118.9066	118.9066	118.9066	118.9066	118.9066	118.9066	118.9066	118.9066	118.9066 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.1038	16.9678	13.7991	10.4468	7.8091	6.5928	7.1237	9.2597	12.4284	15.7807	18.4184	19.6347 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	210.4176	212.6011	207.0988	195.3851	180.5986	166.7014	157.4172	155.2338	160.7360	172.4498	187.2362	201.1334 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.8907	34.8907	34.8907	34.8907	34.8907	34.8907	34.8907	34.8907	34.8907	34.8907	34.8907	34.8907 (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)	-95.1253	-95.1253	-95.1253	-95.1253	-95.1253	-95.1253	-95.1253	-95.1253	-95.1253	-95.1253	-95.1253	-95.1253 (71)
Water heating gains (Table 5)	123.8064	121.7117	117.3618	111.4482	107.6089	102.2029	97.6080	103.4954	105.5871	111.7079	118.6192	121.7205 (72)
Total internal gains	414.9998	412.9526	399.9318	378.9521	357.6886	337.1691	323.8210	329.6608	340.4235	361.6103	385.9458	404.1606 (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				11.8800	10.6334	0.6300		0.7000		0.7700		38.6065 (74)
South				2.0200	46.7521	0.6300		0.7000		0.7700		28.8618 (78)
Solar gains	67.4683	121.0472	185.5798	269.4258	342.1834	358.6469	337.8069	279.8601	213.6314	138.8074	81.8372	57.1235 (83)
Total gains	482.4681	533.9998	585.5116	648.3779	699.8720	695.8161	661.6278	609.5209	554.0549	500.4177	467.7830	461.2841 (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	91.4767	91.8202	92.1663	93.9367	94.2990	96.1531	96.1531	96.5327	95.4028	94.2990	93.5772	92.8664
alpha	7.0984	7.1213	7.1444	7.2624	7.2866	7.4102	7.4102	7.4355	7.3602	7.2866	7.2385	7.1911
util living area	0.9962	0.9913	0.9738	0.8976	0.7180	0.5019	0.3639	0.4111	0.6729	0.9339	0.9901	0.9972 (86)
MIT	20.3594	20.4747	20.6556	20.8715	20.9778	20.9985	20.9999	20.9997	20.9894	20.8484	20.5735	20.3419 (87)
Th 2	20.2889	20.2914	20.2938	20.3063	20.3088	20.3212	20.3212	20.3237	20.3162	20.3088	20.3038	20.2988 (88)
util rest of house	0.9951	0.9888	0.9661	0.8725	0.6720	0.4494	0.3078	0.3509	0.6119	0.9113	0.9867	0.9963 (89)
MIT 2	19.4294	19.5988	19.8595	20.1624	20.2888	20.3203	20.3212	20.3236	20.3086	20.1403	19.7527	19.4120 (90)
Living area fraction	19.7999	19.9477	20.1766	20.4448	20.5632	20.5905	20.5915	20.5929	20.5798	20.4223	20.0796	19.7824 (91)
MIT	19.7999	19.9477	20.1766	20.4448	20.5632	20.5905	20.5915	20.5929	20.5798	20.4223	20.0796	19.7824 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7999	19.9477	20.1766	20.4448	20.5632	20.5905	20.5915	20.5929	20.5798	20.4223	20.0796	19.7824 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9941	0.9872	0.9647	0.8779	0.6893	0.4703	0.3302	0.3749	0.6359	0.9154	0.9853	0.9955 (94)
Ext temp.	479.6208	527.1711	564.8198	569.2302	482.4264	327.2468	218.4479	228.5120	352.3043	458.1072	460.9047	459.2096 (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	891.7980	862.5435	781.0100	646.8479	494.6922	327.9053	218.4877	228.6094	357.4785	548.2228	730.0311	883.1333 (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	306.6599	225.3703	160.8455	55.8848	9.1258	0.0000	0.0000	0.0000	0.0000	67.0460	193.7710	315.3992 (98)
Space heating per m2												1334.1025 (98)
												(98) / (4) = 17.6026 (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

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 %)	175.1000 (206)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Space heating requirement	761.9089 (211)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	306.6599	225.3703	160.8455	55.8848	9.1258	0.0000	0.0000	0.0000	0.0000	67.0460	193.7710	315.3992 (98)
Space heating efficiency (main heating system 1)	175.1000	175.1000	175.1000	175.1000	175.1000	0.0000	0.0000	0.0000	0.0000	175.1000	175.1000	175.1000 (210)
Space heating fuel (main heating system)	175.1341	128.7095	91.8592	31.9159	5.2117	0.0000	0.0000	0.0000	0.0000	38.2901	110.6631	180.1252 (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	201.5833	177.8417	187.1630	168.3200	165.3399	148.3001	142.9619	156.1354	155.6283	174.5117	183.8482	196.9158 (64)
Efficiency of water heater (217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000 (216)
Fuel for water heating, kWh/month	115.1247	101.5658	106.8892	96.1279	94.4260	84.6945	81.6459	89.1693	88.8797	99.6640	104.9961	112.4590 (219)
Water heating fuel used												1175.6421 (219)
Annual totals kWh/year												
Space heating fuel - main system												761.9089 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)												
mechanical ventilation fans (SFP = 0.7500)												187.2392 (230a)
central heating pump												30.0000 (230c)
Total electricity for the above, kWh/year												217.2392 (231)
Electricity for lighting (calculated in Appendix L)												337.3784 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 0.68 * 951 * 1.00) =											-517.1351	-517.1351 (233)
Total delivered energy for all uses												1975.0335 (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	761.9089	0.5190	395.4307 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1175.6421	0.5190	610.1583 (264)
Space and water heating			1005.5890 (265)
Pumps and fans	217.2392	0.5190	112.7471 (267)
Energy for lighting	337.3784	0.5190	175.0994 (268)
Energy saving/generation technologies			
PV Unit	-517.1351	0.5190	-268.3931 (269)
Total CO2, kg/year			1025.0424 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.5200 (273)

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

DER		13.5200 ZC1
Total Floor Area	TFA	75.7900
Assumed number of occupants	N	2.3781
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.4519 ZC2
CO2 emissions from cooking, equation (L16)		2.3232 ZC3
Total CO2 emissions		32.2951 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		32.2951 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	75.7900 (1b)	x 2.7000 (2b)	= 204.6330 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	75.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.6330 (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) = 0.1466 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3966 (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) =	0.3371 (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	0.4298	0.4214	0.4130	0.3708	0.3624	0.3203	0.3203	0.3118	0.3371	0.3624	0.3793	0.3961 (22b)
	0.5924	0.5888	0.5853	0.5688	0.5657	0.5513	0.5513	0.5486	0.5568	0.5657	0.5719	0.5785 (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			2.0500	1.0000	2.0500		(26)
TER Semi-glazed door			6.2900	1.2000	7.5480		(26a)
TER Opening Type (Uw = 1.40)			10.6100	1.3258	14.0663		(27)
Heat Loss Floor 1			5.0500	0.1300	0.6565		(28a)
External Wall 1	50.4300	16.9000	33.5300	0.1800	6.0354		(29a)
Corridor	4.0500	2.0500	2.0000	0.1800	0.3600		(29a)
External Roof 1	9.3300		9.3300	0.1300	1.2129		(30)
Total net area of external elements Aum(A, m ²)			68.8600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.9291		(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)							4.3029 (36)
Total fabric heat loss						(33) + (36) =	36.2320 (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	40.0023	39.7600	39.5226	38.4074	38.1988	37.2275	37.2275	37.0476	37.6016	38.1988	38.6209	39.0621 (38)
Heat transfer coeff	76.2342	75.9920	75.7546	74.6394	74.4308	73.4595	73.4595	73.2796	73.8336	74.4308	74.8529	75.2941 (39)
Average = Sum(39)m / 12 =												74.6384 (39)
HLP	1.0059	1.0027	0.9995	0.9848	0.9821	0.9693	0.9693	0.9669	0.9742	0.9821	0.9876	0.9935 (40)
HLP (average)												0.9848 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3781 (42)
Average daily hot water use (litres/day)												90.6806 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	99.7487	96.1215	92.4942	88.8670	85.2398	81.6126	81.6126	85.2398	88.8670	92.4942	96.1215	99.7487 (44)
Energy content (annual)	147.9244	129.3756	133.5041	116.3921	111.6810	96.3722	89.3030	102.4765	103.7004	120.8528	131.9203	143.2569 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1426.7593 (45)
Water storage loss:	22.1887	19.4063	20.0256	17.4588	16.7521	14.4558	13.3955	15.3715	15.5551	18.1279	19.7880	21.4885 (46)
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (48)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8381 (55)
Total storage loss												
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(56)
If cylinder contains dedicated solar storage												
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(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												
197.1671	173.8529	182.7467	164.0463	160.9236	144.0264	138.5457	151.7192	151.3546	170.0955	179.5745	192.4996	(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												
197.1671	173.8529	182.7467	164.0463	160.9236	144.0264	138.5457	151.7192	151.3546	170.0955	179.5745	192.4996	(64)
Heat gains from water heating, kWh/month												
88.5790	78.5992	83.7842	76.8237	76.5281	70.1671	69.0874	73.4676	72.6037	79.5777	81.9869	87.0271	(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	118.9066	118.9066	118.9066	118.9066	118.9066	118.9066	118.9066	118.9066	118.9066	118.9066	118.9066	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
20.1251	17.8749	14.5369	11.0053	8.2266	6.9453	7.5046	9.7548	13.0928	16.6243	19.4031	20.6844	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
210.4176	212.6011	207.0988	195.3851	180.5986	166.7014	157.4172	155.2338	160.7360	172.4498	187.2362	201.1334	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.8907	34.8907	34.8907	34.8907	34.8907	34.8907	34.8907	34.8907	34.8907	34.8907	34.8907	34.8907	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-95.1253	-95.1253	-95.1253	-95.1253	-95.1253	-95.1253	-95.1253	-95.1253	-95.1253	-95.1253	-95.1253	-95.1253	(71)
Water heating gains (Table 5)												
119.0578	116.9631	112.6132	106.6996	102.8603	97.4543	92.8594	98.7467	100.8385	106.9593	113.8706	116.9718	(72)
Total internal gains	411.2725	409.1111	395.9209	374.7620	353.3575	332.7730	319.4532	325.4072	336.3394	357.7053	382.1819	400.4617 (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				9.0700	10.6334	0.6300		0.7000		0.7700	29.4748 (74)	
South				1.5400	46.7521	0.6300		0.7000		0.7700	22.0036 (78)	

Solar gains	51.4784	92.3641	141.6185	205.6237	261.1686	273.7410	257.8319	213.5935	163.0321	105.9194	62.4427	43.5848 (83)
Total gains	462.7509	501.4751	537.5394	580.3857	614.5261	606.5139	577.2851	539.0007	499.3714	463.6247	444.6246	444.0464 (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	69.0398	69.2598	69.4769	70.5149	70.7126	71.6476	71.6476	71.8234	71.2845	70.7126	70.3139	69.9018
alpha	5.6027	5.6173	5.6318	5.7010	5.7142	5.7765	5.7765	5.7882	5.7523	5.7142	5.6876	5.6601
util living area	0.9978	0.9961	0.9908	0.9697	0.8967	0.7265	0.5511	0.6092	0.8603	0.9779	0.9954	0.9983 (86)
MIT	19.9675	20.0781	20.2791	20.5652	20.8196	20.9622	20.9935	20.9888	20.8978	20.5900	20.2366	19.9519 (87)
Th 2	20.0785	20.0811	20.0837	20.0960	20.0983	20.1090	20.1090	20.1110	20.1049	20.0983	20.0937	20.0888 (88)
util rest of house	0.9971	0.9947	0.9875	0.9581	0.8582	0.6443	0.4442	0.4997	0.7969	0.9672	0.9936	0.9977 (89)
MIT 2	18.6965	18.8599	19.1540	19.5728	19.9154	20.0829	20.1065	20.1062	20.0197	19.6142	19.1009	18.6815 (90)
Living area fraction												
MIT	19.2028	19.3452	19.6022	19.9681	20.2756	20.4332	20.4598	20.4578	20.3695	20.0029	19.5533	0.3983 (91)
Temperature adjustment												
adjusted MIT	19.2028	19.3452	19.6022	19.9681	20.2756	20.4332	20.4598	20.4578	20.3695	20.0029	19.5533	19.1875 (92)
												0.0000
												19.1875 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9961	0.9933	0.9853	0.9561	0.8667	0.6757	0.4870	0.5436	0.8178	0.9658	0.9922	0.9969 (94)
Useful gains	460.9565	498.1148	529.6107	554.9267	532.6173	409.8255	281.1458	293.0124	408.3643	447.7472	441.1489	442.6710 (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	1136.1002	1097.7179	992.5499	826.1190	638.2858	428.5014	283.5395	297.3514	462.8984	699.8674	932.1637	1128.4736 (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	502.3069	402.9332	344.4267	195.2585	78.6173	0.0000	0.0000	0.0000	0.0000	187.5775	353.5307	510.2371 (98)
Space heating												2574.8879 (98)
Space heating per m2												(98) / (4) = 33.9740 (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													2753.8908 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	502.3069	402.9332	344.4267	195.2585	78.6173	0.0000	0.0000	0.0000	0.0000	187.5775	353.5307	510.2371	(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)	537.2267	430.9446	368.3708	208.8326	84.0827	0.0000	0.0000	0.0000	0.0000	200.6176	378.1077	545.7081	(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	197.1671	173.8529	182.7467	164.0463	160.9236	144.0264	138.5457	151.7192	151.3546	170.0955	179.5745	192.4996	(64)
Efficiency of water heater (217)m	87.2041	86.9845	86.4803	85.2793	83.0215	79.8000	79.8000	79.8000	79.8000	85.0751	86.5891	79.8000	(216)
Fuel for water heating, kWh/month	226.0985	199.8666	211.3160	192.3635	193.8336	180.4842	173.6161	190.1243	189.6674	199.9356	207.3869	220.5194	(219)
Water heating fuel used												2385.2122	(219)
Annual totals kWh/year													
Space heating fuel - main system												2753.8908	(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)												355.4152	(232)
Total delivered energy for all uses												5569.5182	(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	2753.8908	0.2160	594.8404 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2385.2122	0.2160	515.2058 (264)
Space and water heating			1110.0462 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	355.4152	0.5190	184.4605 (268)
Total CO2, kg/m2/year			1333.4317 (272)
Emissions per m2 for space and water heating			14.6463 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4338 (272b)
Emissions per m2 for pumps and fans			0.5136 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.6463 * 1.55) + 2.4338 + 0.5136, rounded to 2 d.p.			25.6500 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 9			Issued on Date	13/04/2022
Assessment Reference	Unit 9_Be Lean	Prop Type Ref	160 Malden Road		
Property	160, Malden Road				
SAP Rating	85 B	DER	14.48	TER	17.59
Environmental	89 B	% DER<TER	17.70		
CO ₂ Emissions (t/year)	0.91	DFEE	38.93	TFEE	46.86
General Requirements Compliance	Pass	% DFEE<TFEE	16.93		
Assessor Details	Mr. Andy Love, Love Design Studio Ltd, Tel: 07563755762, Mail@lovedesignstudio.co.uk			Assessor ID	9990-1318
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 76 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
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.59 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.48 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)46.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)38.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.22 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.100

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
x x

Efficiency: 90%
Minimum: 88% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage Nominal cylinder loss: 1.82 kWh/day
Permitted by DBSCG 2.10 OK
Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK
Independent timer for DHW OK

Boiler interlock Yes OK

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: 0.60
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: 11.88 m², No overhang
Windows facing South: 2.02 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Roof U-value 0.12 W/m²K
Floor U-value 0.00 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	75.7900 (1b)	x 2.7000 (2b)	= 204.6330 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	75.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.6330 (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
windows (Uw = 1.20)			13.9000	1.1450	15.9160		(27)
Half glazed doors			6.2900	1.2000	7.5480		(26a)
Solid Door			2.0500	1.4000	2.8700		(26)
Heat Loss Floor 1			5.0500	0.0000	0.0000		(28a)
External Wall 1	50.4300	20.1900	30.2400	0.1400	4.2336		(29a)
Corridor	4.0500	2.0500	2.0000	0.1342	0.2684		(29a)
External Roof 1	9.3300		9.3300	0.1200	1.1196		(30)
Total net area of external elements Aum(A, m2)			63.8100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.9556		(33)
Party Wall 1			51.4800	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (User defined value 0.100 * total exposed area)							6.3810 (36)
Total fabric heat loss							(33) + (36) = 38.3366 (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	19.1993	18.9841	18.7688	17.6926	17.4773	16.4011	16.4011	16.1858	16.8316	17.4773	17.9078	18.3383 (38)
Heat transfer coeff	57.5359	57.3206	57.1054	56.0292	55.8139	54.7377	54.7377	54.5224	55.1682	55.8139	56.2444	56.6749 (39)
Average = Sum(39)m / 12 =												55.9753 (39)
HLP	0.7591	0.7563	0.7535	0.7393	0.7364	0.7222	0.7222	0.7194	0.7279	0.7364	0.7421	0.7478 (40)
HLP (average)												0.7386 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3781 (42)
Average daily hot water use (litres/day)												90.6806 (43)
Daily hot water use	99.7487	96.1215	92.4942	88.8670	85.2398	81.6126	81.6126	85.2398	88.8670	92.4942	96.1215	99.7487 (44)
Energy conte	147.9244	129.3756	133.5041	116.3921	111.6810	96.3722	89.3030	102.4765	103.7004	120.8528	131.9203	143.2569 (45)
Energy content (annual)												Total = Sum(45)m = 1426.7593 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	22.1887	19.4063	20.0256	17.4588	16.7521	14.4558	13.3955	15.3715	15.5551	18.1279	19.7880	21.4885 (46)
Water storage loss:												
Store volume												180.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0115 (51)
Volume factor from Table 2a												0.8736 (52)
Temperature factor from Table 2b												0.5400 (53)
Enter (49) or (54) in (55)												0.9805 (55)
Total storage loss	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (56)
If cylinder contains dedicated solar storage	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (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	201.5833	177.8417	187.1630	168.3200	165.3399	148.3001	142.9619	156.1354	155.6283	174.5117	183.8482	196.9158 (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	201.5833	177.8417	187.1630	168.3200	165.3399	148.3001	142.9619	156.1354	155.6283	174.5117	183.8482	196.9158 (64)
Heat gains from water heating, kWh/month	92.1120	81.7903	87.3172	80.2427	80.0610	73.5861	72.6204	77.0005	76.0227	83.1107	85.4059	90.5600 (65)
Total per year (kWh/year) = Sum (64)m =												2058.5494 (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	118.9066	118.9066	118.9066	118.9066	118.9066	118.9066	118.9066	118.9066	118.9066	118.9066	118.9066	118.9066 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.1038	16.9678	13.7991	10.4468	7.8091	6.5928	7.1237	9.2597	12.4284	15.7807	18.4184	19.6347 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	210.4176	212.6011	207.0988	195.3851	180.5986	166.7014	157.4172	155.2338	160.7360	172.4498	187.2362	201.1334 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.8907	34.8907	34.8907	34.8907	34.8907	34.8907	34.8907	34.8907	34.8907	34.8907	34.8907	34.8907 (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)	-95.1253	-95.1253	-95.1253	-95.1253	-95.1253	-95.1253	-95.1253	-95.1253	-95.1253	-95.1253	-95.1253	-95.1253 (71)
Water heating gains (Table 5)	123.8064	121.7117	117.3618	111.4482	107.6089	102.2029	97.6080	103.4954	105.5871	111.7079	118.6192	121.7205 (72)
Total internal gains	414.9998	412.9526	399.9318	378.9521	357.6886	337.1691	323.8210	329.6608	340.4235	361.6103	385.9458	404.1606 (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				11.8800	10.6334	0.6300		0.7000		0.7700		38.6065 (74)
South				2.0200	46.7521	0.6300		0.7000		0.7700		28.8618 (78)
Solar gains	67.4683	121.0472	185.5798	269.4258	342.1834	358.6469	337.8069	279.8601	213.6314	138.8074	81.8372	57.1235 (83)
Total gains	482.4681	533.9998	585.5116	648.3779	699.8720	695.8161	661.6278	609.5209	554.0549	500.4177	467.7830	461.2841 (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	91.4767	91.8202	92.1663	93.9367	94.2990	96.1531	96.1531	96.5327	95.4028	94.2990	93.5772	92.8664
alpha	7.0984	7.1213	7.1444	7.2624	7.2866	7.4102	7.4102	7.4355	7.3602	7.2866	7.2385	7.1911
util living area	0.9962	0.9913	0.9738	0.8976	0.7180	0.5019	0.3639	0.4111	0.6729	0.9339	0.9901	0.9972 (86)
MIT	20.3594	20.4747	20.6556	20.8715	20.9778	20.9985	20.9999	20.9997	20.9894	20.8484	20.5735	20.3419 (87)
Th 2	20.2889	20.2914	20.2938	20.3063	20.3088	20.3212	20.3212	20.3237	20.3162	20.3088	20.3038	20.2988 (88)
util rest of house	0.9951	0.9888	0.9661	0.8725	0.6720	0.4494	0.3078	0.3509	0.6119	0.9113	0.9867	0.9963 (89)
MIT 2	19.4294	19.5988	19.8595	20.1624	20.2888	20.3203	20.3212	20.3236	20.3086	20.1403	19.7527	19.4120 (90)
Living area fraction	19.7999	19.9477	20.1766	20.4448	20.5632	20.5905	20.5915	20.5929	20.5798	20.4223	20.0796	0.3983 (91)
MIT	19.7999	19.9477	20.1766	20.4448	20.5632	20.5905	20.5915	20.5929	20.5798	20.4223	20.0796	19.7824 (92)
Temperature adjustment	19.6499	19.7977	20.0266	20.2948	20.4132	20.4405	20.4415	20.4429	20.4298	20.2723	19.9296	-0.1500
adjusted MIT	19.6499	19.7977	20.0266	20.2948	20.4132	20.4405	20.4415	20.4429	20.4298	20.2723	19.9296	19.6324 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	479.4507	526.7734	563.6497	565.4350	475.3243	319.1509	210.2477	220.3579	344.7907	455.3442	460.4376	459.0829 (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	883.1676	853.9454	772.4442	638.4436	486.3201	319.6946	210.2771	220.4310	349.2033	539.8507	721.5944	874.6320 (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	300.3654	219.8596	155.3431	52.5662	8.1809	0.0000	0.0000	0.0000	0.0000	62.8728	188.0329	309.1686 (98)
Space heating												1296.3895 (98)
Space heating per m2												17.1050 (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

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 %)														89.5000 (206)
Efficiency of secondary/supplementary heating system, %														0.0000 (208)
Space heating requirement														1448.4799 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	300.3654	219.8596	155.3431	52.5662	8.1809	0.0000	0.0000	0.0000	0.0000	62.8728	188.0329	309.1686	(98)	
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)	
Space heating fuel (main heating system)	335.6038	245.6532	173.5677	58.7331	9.1407	0.0000	0.0000	0.0000	0.0000	70.2490	210.0927	345.4397	(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	201.5833	177.8417	187.1630	168.3200	165.3399	148.3001	142.9619	156.1354	155.6283	174.5117	183.8482	196.9158	(64)	
Efficiency of water heater (217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(216)	
Fuel for water heating, kWh/month	225.2327	198.7058	209.1206	188.0671	184.7373	165.6985	159.7339	174.4529	173.8864	194.9851	205.4170	220.0176	(219)	
Water heating fuel used												2300.0551	(219)	
Annual totals kWh/year														
Space heating fuel - main system												1448.4799	(211)	
Space heating fuel - secondary												0.0000	(215)	
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)														
mechanical ventilation fans (SFP = 0.7500)													187.2392	(230a)
central heating pump													30.0000	(230c)
Total electricity for the above, kWh/year													217.2392	(231)
Electricity for lighting (calculated in Appendix L)													337.3784	(232)
Total delivered energy for all uses													4303.1526	(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	1448.4799	0.2160	312.8717	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2300.0551	0.2160	496.8119	(264)
Space and water heating			809.6836	(265)
Pumps and fans	217.2392	0.5190	112.7471	(267)
Energy for lighting	337.3784	0.5190	175.0994	(268)
Total CO2, kg/year			1097.5301	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.4800	(273)

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

DER		14.4800	ZC1
Total Floor Area	TFA	75.7900	
Assumed number of occupants	N	2.3781	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.4519	ZC2
CO2 emissions from cooking, equation (L16)		2.3232	ZC3
Total CO2 emissions		33.2551	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		33.2551	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	75.7900 (1b)	x 2.7000 (2b)	= 204.6330 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	75.7900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 204.6330 (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) = 0.1466 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3966 (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) =				0.3371 (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	0.4298	0.4214	0.4130	0.3708	0.3624	0.3203	0.3203	0.3118	0.3371	0.3624	0.3793	0.3961 (22b)
	0.5924	0.5888	0.5853	0.5688	0.5657	0.5513	0.5513	0.5486	0.5568	0.5657	0.5719	0.5785 (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			2.0500	1.0000	2.0500		(26)
TER Semi-glazed door			6.2900	1.2000	7.5480		(26a)
TER Opening Type (Uw = 1.40)			10.6100	1.3258	14.0663		(27)
Heat Loss Floor 1			5.0500	0.1300	0.6565		(28a)
External Wall 1	50.4300	16.9000	33.5300	0.1800	6.0354		(29a)
Corridor	4.0500	2.0500	2.0000	0.1800	0.3600		(29a)
External Roof 1	9.3300		9.3300	0.1300	1.2129		(30)
Total net area of external elements Aum(A, m ²)			68.8600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.9291		(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)							4.3029 (36)
Total fabric heat loss						(33) + (36) =	36.2320 (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	40.0023	39.7600	39.5226	38.4074	38.1988	37.2275	37.2275	37.0476	37.6016	38.1988	38.6209	39.0621 (38)
Heat transfer coeff	76.2342	75.9920	75.7546	74.6394	74.4308	73.4595	73.4595	73.2796	73.8336	74.4308	74.8529	75.2941 (39)
Average = Sum(39)m / 12 =												74.6384 (39)
HLP	1.0059	1.0027	0.9995	0.9848	0.9821	0.9693	0.9693	0.9669	0.9742	0.9821	0.9876	0.9935 (40)
HLP (average)												0.9848 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3781 (42)
Average daily hot water use (litres/day)												90.6806 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	99.7487	96.1215	92.4942	88.8670	85.2398	81.6126	81.6126	85.2398	88.8670	92.4942	96.1215	99.7487 (44)
Energy content (annual)	147.9244	129.3756	133.5041	116.3921	111.6810	96.3722	89.3030	102.4765	103.7004	120.8528	131.9203	143.2569 (45)
Distribution loss (46)m = 0.15 x (45)m	22.1887	19.4063	20.0256	17.4588	16.7521	14.4558	13.3955	15.3715	15.5551	18.1279	19.7880	21.4885 (46)
Water storage loss:												180.0000 (47)
Store volume												1.5520 (48)
a) If manufacturer declared loss factor is known (kWh/day):												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8381 (55)
Total storage loss												
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(56)
If cylinder contains dedicated solar storage												
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(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												
197.1671	173.8529	182.7467	164.0463	160.9236	144.0264	138.5457	151.7192	151.3546	170.0955	179.5745	192.4996	(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												
197.1671	173.8529	182.7467	164.0463	160.9236	144.0264	138.5457	151.7192	151.3546	170.0955	179.5745	192.4996	(64)
Heat gains from water heating, kWh/month												
88.5790	78.5992	83.7842	76.8237	76.5281	70.1671	69.0874	73.4676	72.6037	79.5777	81.9869	87.0271	(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	118.9066	118.9066	118.9066	118.9066	118.9066	118.9066	118.9066	118.9066	118.9066	118.9066	118.9066	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
20.1251	17.8749	14.5369	11.0053	8.2266	6.9453	7.5046	9.7548	13.0928	16.6243	19.4031	20.6844	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
210.4176	212.6011	207.0988	195.3851	180.5986	166.7014	157.4172	155.2338	160.7360	172.4498	187.2362	201.1334	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.8907	34.8907	34.8907	34.8907	34.8907	34.8907	34.8907	34.8907	34.8907	34.8907	34.8907	34.8907	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-95.1253	-95.1253	-95.1253	-95.1253	-95.1253	-95.1253	-95.1253	-95.1253	-95.1253	-95.1253	-95.1253	-95.1253	(71)
Water heating gains (Table 5)												
119.0578	116.9631	112.6132	106.6996	102.8603	97.4543	92.8594	98.7467	100.8385	106.9593	113.8706	116.9718	(72)
Total internal gains	411.2725	409.1111	395.9209	374.7620	353.3575	332.7730	319.4532	325.4072	336.3394	357.7053	382.1819	400.4617 (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				9.0700	10.6334	0.6300		0.7000		0.7700		29.4748 (74)
South				1.5400	46.7521	0.6300		0.7000		0.7700		22.0036 (78)
Solar gains	51.4784	92.3641	141.6185	205.6237	261.1686	273.7410	257.8319	213.5935	163.0321	105.9194	62.4427	43.5848 (83)
Total gains	462.7509	501.4751	537.5394	580.3857	614.5261	606.5139	577.2851	539.0007	499.3714	463.6247	444.6246	444.0464 (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	69.0398	69.2598	69.4769	70.5149	70.7126	71.6476	71.6476	71.8234	71.2845	70.7126	70.3139	69.9018
alpha	5.6027	5.6173	5.6318	5.7010	5.7142	5.7765	5.7765	5.7882	5.7523	5.7142	5.6876	5.6601
util living area	0.9978	0.9961	0.9908	0.9697	0.8967	0.7265	0.5511	0.6092	0.8603	0.9779	0.9954	0.9983 (86)
MIT	19.9675	20.0781	20.2791	20.5652	20.8196	20.9622	20.9935	20.9888	20.8978	20.5900	20.2366	19.9519 (87)
Th 2	20.0785	20.0811	20.0837	20.0960	20.0983	20.1090	20.1090	20.1110	20.1049	20.0983	20.0937	20.0888 (88)
util rest of house	0.9971	0.9947	0.9875	0.9581	0.8582	0.6443	0.4442	0.4997	0.7969	0.9672	0.9936	0.9977 (89)
MIT 2	18.6965	18.8599	19.1540	19.5728	19.9154	20.0829	20.1065	20.1062	20.0197	19.6142	19.1009	18.6815 (90)
Living area fraction												
MIT	19.2028	19.3452	19.6022	19.9681	20.2756	20.4332	20.4598	20.4578	20.3695	20.0029	19.5533	0.3983 (91)
Temperature adjustment												
adjusted MIT	19.2028	19.3452	19.6022	19.9681	20.2756	20.4332	20.4598	20.4578	20.3695	20.0029	19.5533	19.1875 (92)
												0.0000
												19.1875 (93)

8. Space heating requirement

Utilisation	0.9961	0.9933	0.9853	0.9561	0.8667	0.6757	0.4870	0.5436	0.8178	0.9658	0.9922	0.9969 (94)
Useful gains	460.9565	498.1148	529.6107	554.9267	532.6173	409.8255	281.1458	293.0124	408.3643	447.7472	441.1489	442.6710 (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	1136.1002	1097.7179	992.5499	826.1190	638.2858	428.5014	283.5395	297.3514	462.8984	699.8674	932.1637	1128.4736 (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	502.3069	402.9332	344.4267	195.2585	78.6173	0.0000	0.0000	0.0000	0.0000	187.5775	353.5307	510.2371 (98)
Space heating												2574.8879 (98)
Space heating per m2												(98) / (4) = 33.9740 (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													2753.8908 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	502.3069	402.9332	344.4267	195.2585	78.6173	0.0000	0.0000	0.0000	0.0000	187.5775	353.5307	510.2371	(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)	537.2267	430.9446	368.3708	208.8326	84.0827	0.0000	0.0000	0.0000	0.0000	200.6176	378.1077	545.7081	(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	197.1671	173.8529	182.7467	164.0463	160.9236	144.0264	138.5457	151.7192	151.3546	170.0955	179.5745	192.4996	(64)
Efficiency of water heater (217)m	87.2041	86.9845	86.4803	85.2793	83.0215	79.8000	79.8000	79.8000	79.8000	85.0751	86.5891	79.8000	(216)
Fuel for water heating, kWh/month	226.0985	199.8666	211.3160	192.3635	193.8336	180.4842	173.6161	190.1243	189.6674	199.9356	207.3869	220.5194	(219)
Water heating fuel used												2385.2122	(219)
Annual totals kWh/year													
Space heating fuel - main system												2753.8908	(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)												355.4152	(232)
Total delivered energy for all uses												5569.5182	(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	2753.8908	0.2160	594.8404 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2385.2122	0.2160	515.2058 (264)
Space and water heating			1110.0462 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	355.4152	0.5190	184.4605 (268)
Total CO2, kg/m2/year			1333.4317 (272)
Emissions per m2 for space and water heating			14.6463 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4338 (272b)
Emissions per m2 for pumps and fans			0.5136 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.6463 * 1.00) + 2.4338 + 0.5136, rounded to 2 d.p.			17.5900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 10			Issued on Date	13/04/2022
Assessment Reference	Unit 10_Be Green	Prop Type Ref	160 Malden Road		
Property	160, Malden Road				
SAP Rating	91 B	DER	12.29	TER	24.19
Environmental	92 A	% DER<TER	49.20		
CO ₂ Emissions (t/year)	0.64	DFEE	31.41	TFEE	38.03
General Requirements Compliance	Pass	% DFEE<TFEE	17.39		
Assessor Details	Mr. Andy Love, Love Design Studio Ltd, Tel: 07563755762, Mail@lovedesignstudio.co.uk			Assessor ID	U860-0001
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 65 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
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 24.19 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.29 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)38.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)31.4 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.23 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.100

3 Air permeability

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

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric
Air-to-water heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water storage Nominal cylinder loss: 1.82 kWh/day
Permitted by DBSCG 2.10 OK
Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

Cylinderstat OK
Independent timer for DHW OK

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: 0.60
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 South: 8.01 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Roof U-value 0.12 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.68 kW

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	65.4100 (1b)	x 2.7000 (2b)	= 176.6070 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.4100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.6070 (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
windows (Uw = 1.20)			8.0100	1.1450	9.1718		(27)
Half glazed doors			6.2900	1.2000	7.5480		(26a)
Solid Door			2.0500	1.4000	2.8700		(26)
External Wall 1	28.8000	14.3000	14.5000	0.1400	2.0300		(29a)
Corridor	8.4500	2.0500	6.4000	0.1342	0.8587		(29a)
stairs	14.5700		14.5700	0.1321	1.9240		(29a)
External Roof 1	7.3900		7.3900	0.1200	0.8868		(30)
Total net area of external elements Aum(A, m ²)			59.2100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.2893		(33)
Party Wall 1			72.7100	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 250.0000 (35)
Thermal bridges (User defined value 0.100 * total exposed area) 5.9210 (36)
Total fabric heat loss (33) + (36) = 31.2103 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	16.5698	16.3841	16.1983	15.2694	15.0837	14.1548	14.1548	13.9691	14.5264	15.0837	15.4552	15.8267 (38)
Heat transfer coeff	47.7801	47.5943	47.4085	46.4797	46.2939	45.3651	45.3651	45.1793	45.7366	46.2939	46.6655	47.0370 (39)
Average = Sum(39)m / 12 =												46.4333 (39)
HLP	0.7305	0.7276	0.7248	0.7106	0.7078	0.6935	0.6935	0.6907	0.6992	0.7078	0.7134	0.7191 (40)
HLP (average)												0.7099 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1298 (42)
Average daily hot water use (litres/day)												84.7818 (43)
Daily hot water use	93.2600	89.8687	86.4775	83.0862	79.6949	76.3037	76.3037	79.6949	83.0862	86.4775	89.8687	93.2600 (44)
Energy conte	138.3019	120.9597	124.8196	108.8208	104.4161	90.1032	83.4938	95.8104	96.9547	112.9913	123.3389	133.9380 (45)
Energy content (annual)										Total = Sum(45)m =		1333.9484 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	20.7453	18.1440	18.7229	16.3231	15.6624	13.5155	12.5241	14.3716	14.5432	16.9487	18.5008	20.0907 (46)
Water storage loss:												
Store volume												180.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0115 (51)
Volume factor from Table 2a												0.8736 (52)
Temperature factor from Table 2b												0.5400 (53)
Enter (49) or (54) in (55)												0.9805 (55)
Total storage loss	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (56)
If cylinder contains dedicated solar storage	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (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	191.9608	169.4258	178.4785	160.7487	158.0750	142.0311	137.1527	149.4693	148.8826	166.6502	175.2668	187.5969 (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	191.9608	169.4258	178.4785	160.7487	158.0750	142.0311	137.1527	149.4693	148.8826	166.6502	175.2668	187.5969 (64)
Heat gains from water heating, kWh/month	88.9125	78.9920	84.4296	77.7253	77.6455	71.5017	70.6888	74.7841	73.7798	80.4967	82.5525	87.4615 (65)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Total per year (kWh/year) = Sum(64)m =												1965.7385 (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	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3581	16.3055	13.2605	10.0391	7.5043	6.3355	6.8457	8.8983	11.9433	15.1647	17.6995	18.8683	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	186.3568	188.2906	183.4175	173.0432	159.9476	147.6395	139.4169	137.4831	142.3562	152.7305	165.8262	178.1343	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	(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)	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	(71)
Water heating gains (Table 5)	119.5060	117.5476	113.4807	107.9518	104.3622	99.3079	95.0118	100.5162	102.4719	108.1945	114.6563	117.5558	(72)
Total internal gains	382.1674	380.0902	368.1052	348.9805	329.7605	311.2292	299.2209	304.8441	314.7179	334.0362	356.1284	372.5048	(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			
South				8.0100	46.7521	0.6300	0.7000	0.7700	114.4472 (78)			
Solar gains	114.4472	187.4350	238.7590	269.8494	281.1998	270.6166	264.4089	256.7776	249.4119	202.1662	135.6590	98.8929 (83)
Total gains	496.6146	567.5252	606.8641	618.8299	610.9603	581.8458	563.6297	561.6217	564.1298	536.2024	491.7873	471.3977 (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	95.0681	95.4392	95.8131	97.7278	98.1200	100.1290	100.1290	100.5407	99.3156	98.1200	97.3388	96.5699
alpha	7.3379	7.3626	7.3875	7.5152	7.5413	7.6753	7.6753	7.7027	7.6210	7.5413	7.4893	7.4380
util living area	0.9881	0.9691	0.9280	0.8363	0.6890	0.4978	0.3541	0.3699	0.5564	0.8302	0.9664	0.9912 (86)
MIT	20.5224	20.6635	20.8067	20.9300	20.9851	20.9989	20.9999	20.9999	20.9974	20.9433	20.7295	20.4968 (87)
Th 2	20.3140	20.3165	20.3190	20.3315	20.3340	20.3465	20.3465	20.3490	20.3415	20.3340	20.3290	20.3240 (88)
util rest of house	0.9849	0.9613	0.9116	0.8055	0.6447	0.4475	0.3015	0.3176	0.5046	0.7937	0.9567	0.9888 (89)
MIT 2	19.6855	19.8878	20.0867	20.2564	20.3208	20.3458	20.3465	20.3490	20.3397	20.2767	19.9935	19.6569 (90)
Living area fraction									fLA = Living area / (4) =			
MIT	19.9498	20.1328	20.3141	20.4691	20.5306	20.5521	20.5529	20.5546	20.5474	20.4873	20.2260	19.9222 (91)
Temperature adjustment												0.0000
adjusted MIT	19.9498	20.1328	20.3141	20.4691	20.5306	20.5521	20.5529	20.5546	20.5474	20.4873	20.2260	19.9222 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9828	0.9589	0.9115	0.8121	0.6581	0.4634	0.3181	0.3342	0.5209	0.8025	0.9549	0.9870 (94)
Useful gains	488.0537	544.2001	553.1638	502.5817	402.0493	269.6181	179.3047	187.6748	293.8772	430.3168	469.6259	465.2602 (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	747.7494	724.9954	654.9070	537.7291	408.8023	270.0180	179.3234	187.7018	294.8841	457.7199	612.5288	739.5251 (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	193.2136	121.4944	75.6969	25.3062	5.0243	0.0000	0.0000	0.0000	0.0000	20.3879	102.8901	204.0530 (98)
Space heating												748.0664 (98)
Space heating per m2												11.4366 (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

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 %)													175.1000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													427.2224 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	193.2136	121.4944	75.6969	25.3062	5.0243	0.0000	0.0000	0.0000	0.0000	20.3879	102.8901	204.0530	(98)
Space heating efficiency (main heating system 1)	175.1000	175.1000	175.1000	175.1000	175.1000	0.0000	0.0000	0.0000	0.0000	175.1000	175.1000	175.1000	(210)
Space heating fuel (main heating system)	110.3447	69.3857	43.2307	14.4524	2.8694	0.0000	0.0000	0.0000	0.0000	11.6436	58.7607	116.5351	(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	191.9608	169.4258	178.4785	160.7487	158.0750	142.0311	137.1527	149.4693	148.8826	166.6502	175.2668	187.5969	(64)
Efficiency of water heater	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)
Fuel for water heating, kWh/month	109.6292	96.7595	101.9295	91.8040	90.2770	81.1143	78.3282	85.3622	85.0272	95.1743	100.0953	107.1370	(219)
Water heating fuel used												1122.6376	(219)
Annual totals kWh/year													
Space heating fuel - main system												427.2224	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)													161.5954 (230a)
central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													191.5954 (231)
Electricity for lighting (calculated in Appendix L)													324.2098 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.68 * 951 * 1.00) =										-517.1351			-517.1351 (233)
Total delivered energy for all uses													1548.5301 (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	427.2224	0.5190	221.7284 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1122.6376	0.5190	582.6489 (264)
Space and water heating			804.3773 (265)
Pumps and fans	191.5954	0.5190	99.4380 (267)
Energy for lighting	324.2098	0.5190	168.2649 (268)
Energy saving/generation technologies			
PV Unit	-517.1351	0.5190	-268.3931 (269)
Total CO2, kg/year			803.6871 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.2900 (273)

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

DER			12.2900 ZC1
Total Floor Area		TFA	65.4100
Assumed number of occupants		N	2.1298
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.8829 ZC2
CO2 emissions from cooking, equation (L16)			2.6007 ZC3
Total CO2 emissions			31.7737 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			31.7737 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	65.4100 (1b)	x 2.7000 (2b)	= 176.6070 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.4100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.6070 (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) = 0.1132 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3632 (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) =				0.3088 (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	0.3937	0.3859	0.3782	0.3396	0.3319	0.2933	0.2933	0.2856	0.3088	0.3319	0.3474	0.3628 (22b)
Effective ac	0.5775	0.5745	0.5715	0.5577	0.5551	0.5430	0.5430	0.5408	0.5477	0.5551	0.5603	0.5658 (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			2.0500	1.0000	2.0500		(26)
TER Semi-glazed door			6.2900	1.2000	7.5480		(26a)
TER Opening Type (Uw = 1.40)			8.0100	1.3258	10.6193		(27)
External Wall 1	28.8000	14.3000	14.5000	0.1800	2.6100		(29a)
Corridor	8.4500	2.0500	6.4000	0.1800	1.1520		(29a)
stairs	14.5700		14.5700	0.1800	2.6226		(29a)
External Roof 1	7.3900		7.3900	0.1300	0.9607		(30)
Total net area of external elements Aum(A, m ²)			59.2100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.5626		(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)							3.6448 (36)
Total fabric heat loss						(33) + (36) =	31.2074 (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	33.6561	33.4808	33.3089	32.5015	32.3505	31.6473	31.6473	31.5171	31.9181	32.3505	32.6561	32.9755 (38)
Heat transfer coeff	64.8635	64.6882	64.5163	63.7089	63.5579	62.8547	62.8547	62.7245	63.1256	63.5579	63.8635	64.1829 (39)
Average = Sum(39)m / 12 =												63.7082 (39)
HLP	0.9916	0.9890	0.9863	0.9740	0.9717	0.9609	0.9609	0.9589	0.9651	0.9717	0.9764	0.9812 (40)
HLP (average)												0.9740 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1298 (42)
Average daily hot water use (litres/day)												84.7818 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	93.2600	89.8687	86.4775	83.0862	79.6949	76.3037	76.3037	79.6949	83.0862	86.4775	89.8687	93.2600 (44)
Energy content (annual)	138.3019	120.9597	124.8196	108.8208	104.4161	90.1032	83.4938	95.8104	96.9547	112.9913	123.3389	133.9380 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1333.9484 (45)
Water storage loss:	20.7453	18.1440	18.7229	16.3231	15.6624	13.5155	12.5241	14.3716	14.5432	16.9487	18.5008	20.0907 (46)
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (48)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8381 (55)
Total storage loss												
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(56)
If cylinder contains dedicated solar storage												
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(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												
187.5446	165.4370	174.0623	156.4750	153.6588	137.7574	132.7365	145.0531	144.6089	162.2340	170.9931	183.1807	(62)
Solar input	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												
187.5446	165.4370	174.0623	156.4750	153.6588	137.7574	132.7365	145.0531	144.6089	162.2340	170.9931	183.1807	(64)
Heat gains from water heating, kWh/month												
85.3795	75.8009	80.8967	74.3063	74.1125	68.0827	67.1558	71.2511	70.3608	76.9638	79.1335	83.9285	(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	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
18.3581	16.3055	13.2605	10.0391	7.5043	6.3355	6.8457	8.8983	11.9433	15.1647	17.6995	18.8683	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
186.3568	188.2906	183.4175	173.0432	159.9476	147.6395	139.4169	137.4831	142.3562	152.7305	165.8262	178.1343	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	(71)
Water heating gains (Table 5)												
114.7574	112.7990	108.7321	103.2031	99.6136	94.5593	90.2632	95.7676	97.7233	103.4459	109.9077	112.8072	(72)
Total internal gains												
377.4188	375.3416	363.3565	344.2319	325.0119	306.4806	294.4723	300.0954	309.9692	329.2876	351.3798	367.7562	(73)

6. Solar gains

[Jan]												
	Area	Solar flux	g	Specific data	FF	Access	Gains					
	m2	Table 6a	W/m2	or Table 6b	or Table 6c	factor	W					
						Table 6d						
South	8.0100	46.7521	0.6300		0.7000	0.7700	114.4472	(78)				
Solar gains	114.4472	187.4350	238.7590	269.8494	281.1998	270.6166	264.4089	256.7776	249.4119	202.1662	135.6590	98.8929 (83)
Total gains	491.8660	562.7766	602.1155	614.0813	606.2117	577.0972	558.8811	556.8731	559.3812	531.4538	487.0387	466.6491 (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	70.0295	70.2193	70.4064	71.2986	71.4681	72.2676	72.2676	72.4177	71.9576	71.4681	71.1261	70.7721
alpha	5.6686	5.6813	5.6938	5.7532	5.7645	5.8178	5.8178	5.8278	5.7972	5.7645	5.7417	5.7181
util living area												
0.9938	0.9858	0.9694	0.9299	0.8412	0.6688	0.4906	0.5127	0.7292	0.9277	0.9854	0.9953	(86)
MIT	20.1212	20.2801	20.4794	20.7036	20.8796	20.9757	20.9965	20.9955	20.9589	20.7508	20.3954	20.0907 (87)
Th 2	20.0903	20.0925	20.0947	20.1051	20.1070	20.1160	20.1160	20.1177	20.1125	20.1070	20.1031	20.0990 (88)
util rest of house												
0.9918	0.9816	0.9599	0.9079	0.7935	0.5880	0.3943	0.4172	0.6537	0.9010	0.9801	0.9938	(89)
MIT 2	18.9288	19.1601	19.4465	19.7654	19.9911	20.1000	20.1147	20.1158	20.0823	19.8344	19.3364	18.8912 (90)
Living area fraction												
19.3054	19.5139	19.7727	20.0617	20.2718	20.3766	20.3932	20.3937	20.3592	20.1238	19.6709	19.2700	(92)
Temperature adjustment												
adjusted MIT	19.3054	19.5139	19.7727	20.0617	20.2718	20.3766	20.3932	20.3937	20.3592	20.1238	19.6709	19.2700 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9896	0.9781	0.9559	0.9067	0.8031	0.6127	0.4249	0.4475	0.6758	0.9015	0.9769	0.9919 (94)
Useful gains	486.7309	550.4309	575.5361	556.7715	486.8454	353.5954	237.4563	249.1850	378.0466	479.1288	475.7857	462.8807 (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	973.3055	945.3453	856.3059	711.1024	544.8026	363.0851	238.4216	250.5009	395.1162	605.3139	802.8190	967.2396 (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	362.0116	265.3825	208.8927	111.1183	43.1202	0.0000	0.0000	0.0000	0.0000	93.8817	235.4639	375.2430 (98)
Space heating												1695.1139 (98)
Space heating per m2										(98) / (4) =		25.9152 (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													1812.9561 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	362.0116	265.3825	208.8927	111.1183	43.1202	0.0000	0.0000	0.0000	0.0000	93.8817	235.4639	375.2430	(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)	387.1781	283.8315	223.4147	118.8431	46.1179	0.0000	0.0000	0.0000	0.0000	100.4083	251.8331	401.3294	(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	187.5446	165.4370	174.0623	156.4750	153.6588	137.7574	132.7365	145.0531	144.6089	162.2340	170.9931	183.1807	(64)
Efficiency of water heater (217)m	86.5400	86.0684	85.3013	83.9201	81.9225	79.8000	79.8000	79.8000	79.8000	83.4151	85.6676	86.6871	(216)
Fuel for water heating, kWh/month	216.7142	192.2157	204.0558	186.4570	187.5661	172.6283	166.3365	181.7708	181.2141	194.4899	199.6006	211.3124	(219)
Water heating fuel used												2294.3614	(219)
Annual totals kWh/year													
Space heating fuel - main system												1812.9561	(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)												324.2098	(232)
Total delivered energy for all uses												4506.5272	(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	1812.9561	0.2160	391.5985 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2294.3614	0.2160	495.5821 (264)
Space and water heating			887.1806 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	324.2098	0.5190	168.2649 (268)
Total CO2, kg/m2/year			1094.3704 (272)
Emissions per m2 for space and water heating			13.5634 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.5725 (272b)
Emissions per m2 for pumps and fans			0.5951 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.5634 * 1.55) + 2.5725 + 0.5951, rounded to 2 d.p.			24.1900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 10			Issued on Date	13/04/2022
Assessment Reference	Unit 10_Be Lean	Prop Type Ref	160 Malden Road		
Property	160, Malden Road				
SAP Rating	85 B	DER	14.01	TER	16.73
Environmental	90 B	% DER<TER	16.26		
CO ₂ Emissions (t/year)	0.80	DFEE	31.41	TFEE	38.03
General Requirements Compliance	Pass	% DFEE<TFEE	17.39		
Assessor Details	Mr. Andy Love, Love Design Studio Ltd, Tel: 07563755762, Mail@lovedesignstudio.co.uk			Assessor ID	U860-0001
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 65 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
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.73 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.01 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)38.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)31.4 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.23 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.100

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
x x

Efficiency: 90%
Minimum: 88% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage Nominal cylinder loss: 1.82 kWh/day
Permitted by DBSCG 2.10 OK
Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK
Independent timer for DHW OK

Boiler interlock Yes OK

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: 0.60
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 South: 8.01 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Roof U-value 0.12 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	65.4100 (1b)	x 2.7000 (2b)	= 176.6070 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.4100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.6070 (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) =												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
windows (Uw = 1.20)			8.0100	1.1450	9.1718		(27)
Half glazed doors			6.2900	1.2000	7.5480		(26a)
Solid Door			2.0500	1.4000	2.8700		(26)
External Wall 1	28.8000	14.3000	14.5000	0.1400	2.0300		(29a)
Corridor	8.4500	2.0500	6.4000	0.1342	0.8587		(29a)
stairs	14.5700		14.5700	0.1321	1.9240		(29a)
External Roof 1	7.3900		7.3900	0.1200	0.8868		(30)
Total net area of external elements Aum(A, m ²)			59.2100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	25.2893			(33)
Party Wall 1			72.7100	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 250.0000 (35)
Thermal bridges (User defined value 0.100 * total exposed area) 5.9210 (36)
Total fabric heat loss (33) + (36) = 31.2103 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	16.5698	16.3841	16.1983	15.2694	15.0837	14.1548	14.1548	13.9691	14.5264	15.0837	15.4552	15.8267 (38)
Heat transfer coeff	47.7801	47.5943	47.4085	46.4797	46.2939	45.3651	45.3651	45.1793	45.7366	46.2939	46.6655	47.0370 (39)
Average = Sum(39)m / 12 =												46.4333 (39)
HLP	0.7305	0.7276	0.7248	0.7106	0.7078	0.6935	0.6935	0.6907	0.6992	0.7078	0.7134	0.7191 (40)
HLP (average)												0.7099 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1298 (42)
Average daily hot water use (litres/day)												84.7818 (43)
Daily hot water use	93.2600	89.8687	86.4775	83.0862	79.6949	76.3037	76.3037	79.6949	83.0862	86.4775	89.8687	93.2600 (44)
Energy conte	138.3019	120.9597	124.8196	108.8208	104.4161	90.1032	83.4938	95.8104	96.9547	112.9913	123.3389	133.9380 (45)
Energy content (annual)										Total = Sum(45)m =		1333.9484 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	20.7453	18.1440	18.7229	16.3231	15.6624	13.5155	12.5241	14.3716	14.5432	16.9487	18.5008	20.0907 (46)
Water storage loss:												
Store volume												180.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0115 (51)
Volume factor from Table 2a												0.8736 (52)
Temperature factor from Table 2b												0.5400 (53)
Enter (49) or (54) in (55)												0.9805 (55)
Total storage loss	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (56)
If cylinder contains dedicated solar storage	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (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	191.9608	169.4258	178.4785	160.7487	158.0750	142.0311	137.1527	149.4693	148.8826	166.6502	175.2668	187.5969 (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	191.9608	169.4258	178.4785	160.7487	158.0750	142.0311	137.1527	149.4693	148.8826	166.6502	175.2668	187.5969 (64)
Heat gains from water heating, kWh/month	88.9125	78.9920	84.4296	77.7253	77.6455	71.5017	70.6888	74.7841	73.7798	80.4967	82.5525	87.4615 (65)
Total per year (kWh/year) = Sum(64)m = 1965.7385 (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	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3581	16.3055	13.2605	10.0391	7.5043	6.3355	6.8457	8.8983	11.9433	15.1647	17.6995	18.8683 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	186.3568	188.2906	183.4175	173.0432	159.9476	147.6395	139.4169	137.4831	142.3562	152.7305	165.8262	178.1343 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488 (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)	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905 (71)
Water heating gains (Table 5)	119.5060	117.5476	113.4807	107.9518	104.3622	99.3079	95.0118	100.5162	102.4719	108.1945	114.6563	117.5558 (72)
Total internal gains	382.1674	380.0902	368.1052	348.9805	329.7605	311.2292	299.2209	304.8441	314.7179	334.0362	356.1284	372.5048 (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		
South				8.0100	46.7521	0.6300	0.7000		0.7700	114.4472 (78)		
Solar gains	114.4472	187.4350	238.7590	269.8494	281.1998	270.6166	264.4089	256.7776	249.4119	202.1662	135.6590	98.8929 (83)
Total gains	496.6146	567.5252	606.8641	618.8299	610.9603	581.8458	563.6297	561.6217	564.1298	536.2024	491.7873	471.3977 (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	95.0681	95.4392	95.8131	97.7278	98.1200	100.1290	100.1290	100.5407	99.3156	98.1200	97.3388	96.5699
alpha	7.3379	7.3626	7.3875	7.5152	7.5413	7.6753	7.6753	7.7027	7.6210	7.5413	7.4893	7.4380
util living area	0.9881	0.9691	0.9280	0.8363	0.6890	0.4978	0.3541	0.3699	0.5564	0.8302	0.9664	0.9912 (86)
MIT	20.5224	20.6635	20.8067	20.9300	20.9851	20.9989	20.9999	20.9999	20.9974	20.9433	20.7295	20.4968 (87)
Th 2	20.3140	20.3165	20.3190	20.3315	20.3340	20.3465	20.3465	20.3490	20.3415	20.3340	20.3290	20.3240 (88)
util rest of house	0.9849	0.9613	0.9116	0.8055	0.6447	0.4475	0.3015	0.3176	0.5046	0.7937	0.9567	0.9888 (89)
MIT 2	19.6855	19.8878	20.0867	20.2564	20.3208	20.3458	20.3465	20.3490	20.3397	20.2767	19.9935	19.6569 (90)
Living area fraction	19.9498	20.1328	20.3141	20.4691	20.5306	20.5521	20.5529	20.5546	20.5474	20.4873	20.2260	19.9222 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.7998	19.9828	20.1641	20.3191	20.3806	20.4021	20.4029	20.4046	20.3974	20.3373	20.0760	19.7722 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9818	0.9568	0.9075	0.8049	0.6479	0.4518	0.3061	0.3221	0.5091	0.7939	0.9523	0.9862 (94)
Useful gains	487.5769	543.0233	550.7053	498.0915	395.8514	262.8859	172.5051	180.9050	287.1813	425.6722	468.3298	464.9057 (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	740.5824	717.8562	647.7957	530.7572	401.8583	263.2133	172.5186	180.9249	288.0236	450.7758	605.5289	732.4695 (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	188.2361	117.4877	72.2353	23.5193	4.4691	0.0000	0.0000	0.0000	0.0000	18.6771	98.7834	199.0675 (98)
Space heating												722.4754 (98)
Space heating per m2										(98) / (4) =		11.0453 (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

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 %)													89.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													807.2351 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	188.2361	117.4877	72.2353	23.5193	4.4691	0.0000	0.0000	0.0000	0.0000	18.6771	98.7834	199.0675	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	210.3197	131.2712	80.7098	26.2785	4.9934	0.0000	0.0000	0.0000	0.0000	20.8683	110.3725	222.4217	(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	191.9608	169.4258	178.4785	160.7487	158.0750	142.0311	137.1527	149.4693	148.8826	166.6502	175.2668	187.5969	(64)
Efficiency of water heater (217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(216)
Fuel for water heating, kWh/month	214.4813	189.3026	199.4173	179.6075	176.6201	158.6940	153.2433	167.0048	166.3493	186.2013	195.8288	209.6055	(219)
Water heating fuel used												2196.3559	(219)
Annual totals kWh/year													
Space heating fuel - main system												807.2351	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)													161.5954 (230a)
central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													191.5954 (231)
Electricity for lighting (calculated in Appendix L)													324.2098 (232)
Total delivered energy for all uses													3519.3961 (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	807.2351	0.2160	174.3628 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2196.3559	0.2160	474.4129 (264)
Space and water heating			648.7756 (265)
Pumps and fans	191.5954	0.5190	99.4380 (267)
Energy for lighting	324.2098	0.5190	168.2649 (268)
Total CO2, kg/year			916.4785 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.0100 (273)

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

DER		14.0100 ZC1
Total Floor Area	TFA	65.4100
Assumed number of occupants	N	2.1298
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.8829 ZC2
CO2 emissions from cooking, equation (L16)		2.6007 ZC3
Total CO2 emissions		33.4937 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		33.4937 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	65.4100 (1b)	x 2.7000 (2b)	= 176.6070 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.4100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.6070 (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) = 0.1132 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3632 (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) =				0.3088 (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	0.3937	0.3859	0.3782	0.3396	0.3319	0.2933	0.2933	0.2856	0.3088	0.3319	0.3474	0.3628 (22b)
Effective ac	0.5775	0.5745	0.5715	0.5577	0.5551	0.5430	0.5430	0.5408	0.5477	0.5551	0.5603	0.5658 (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			2.0500	1.0000	2.0500		(26)
TER Semi-glazed door			6.2900	1.2000	7.5480		(26a)
TER Opening Type (Uw = 1.40)			8.0100	1.3258	10.6193		(27)
External Wall 1	28.8000	14.3000	14.5000	0.1800	2.6100		(29a)
Corridor	8.4500	2.0500	6.4000	0.1800	1.1520		(29a)
stairs	14.5700		14.5700	0.1800	2.6226		(29a)
External Roof 1	7.3900		7.3900	0.1300	0.9607		(30)
Total net area of external elements Aum(A, m ²)			59.2100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.5626		(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)							3.6448 (36)
Total fabric heat loss						(33) + (36) =	31.2074 (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	33.6561	33.4808	33.3089	32.5015	32.3505	31.6473	31.6473	31.5171	31.9181	32.3505	32.6561	32.9755 (38)
Heat transfer coeff	64.8635	64.6882	64.5163	63.7089	63.5579	62.8547	62.8547	62.7245	63.1256	63.5579	63.8635	64.1829 (39)
Average = Sum(39)m / 12 =												63.7082 (39)
HLP	0.9916	0.9890	0.9863	0.9740	0.9717	0.9609	0.9609	0.9589	0.9651	0.9717	0.9764	0.9812 (40)
HLP (average)												0.9740 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1298 (42)
Average daily hot water use (litres/day)												84.7818 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	93.2600	89.8687	86.4775	83.0862	79.6949	76.3037	76.3037	79.6949	83.0862	86.4775	89.8687	93.2600 (44)
Energy content (annual)	138.3019	120.9597	124.8196	108.8208	104.4161	90.1032	83.4938	95.8104	96.9547	112.9913	123.3389	133.9380 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1333.9484 (45)
Water storage loss:	20.7453	18.1440	18.7229	16.3231	15.6624	13.5155	12.5241	14.3716	14.5432	16.9487	18.5008	20.0907 (46)
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (48)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8381 (55)
Total storage loss												
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(56)
If cylinder contains dedicated solar storage												
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(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												
187.5446	165.4370	174.0623	156.4750	153.6588	137.7574	132.7365	145.0531	144.6089	162.2340	170.9931	183.1807	(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												
187.5446	165.4370	174.0623	156.4750	153.6588	137.7574	132.7365	145.0531	144.6089	162.2340	170.9931	183.1807	(64)
Heat gains from water heating, kWh/month												
85.3795	75.8009	80.8967	74.3063	74.1125	68.0827	67.1558	71.2511	70.3608	76.9638	79.1335	83.9285	(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	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
18.3581	16.3055	13.2605	10.0391	7.5043	6.3355	6.8457	8.8983	11.9433	15.1647	17.6995	18.8683	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
186.3568	188.2906	183.4175	173.0432	159.9476	147.6395	139.4169	137.4831	142.3562	152.7305	165.8262	178.1343	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	(71)
Water heating gains (Table 5)												
114.7574	112.7990	108.7321	103.2031	99.6136	94.5593	90.2632	95.7676	97.7233	103.4459	109.9077	112.8072	(72)
Total internal gains												
377.4188	375.3416	363.3565	344.2319	325.0119	306.4806	294.4723	300.0954	309.9692	329.2876	351.3798	367.7562	(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
South						8.0100	46.7521	0.6300	0.7000			0.7700	114.4472 (78)
Solar gains	114.4472	187.4350	238.7590	269.8494	281.1998	270.6166	264.4089	256.7776	249.4119	202.1662	135.6590	98.8929	(83)
Total gains	491.8660	562.7766	602.1155	614.0813	606.2117	577.0972	558.8811	556.8731	559.3812	531.4538	487.0387	466.6491	(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	70.0295	70.2193	70.4064	71.2986	71.4681	72.2676	72.2676	72.4177	71.9576	71.4681	71.1261	70.7721
alpha	5.6686	5.6813	5.6938	5.7532	5.7645	5.8178	5.8178	5.8278	5.7972	5.7645	5.7417	5.7181
util living area	0.9938	0.9858	0.9694	0.9299	0.8412	0.6688	0.4906	0.5127	0.7292	0.9277	0.9854	0.9953 (86)
MIT	20.1212	20.2801	20.4794	20.7036	20.8796	20.9757	20.9965	20.9955	20.9589	20.7508	20.3954	20.0907 (87)
Th 2	20.0903	20.0925	20.0947	20.1051	20.1070	20.1160	20.1160	20.1177	20.1125	20.1070	20.1031	20.0990 (88)
util rest of house	0.9918	0.9816	0.9599	0.9079	0.7935	0.5880	0.3943	0.4172	0.6537	0.9010	0.9801	0.9938 (89)
MIT 2	18.9288	19.1601	19.4465	19.7654	19.9911	20.1000	20.1147	20.1158	20.0823	19.8344	19.3364	18.8912 (90)
Living area fraction	19.3054	19.5139	19.7727	20.0617	20.2718	20.3766	20.3932	20.3937	20.3592	20.1238	19.6709	19.2700 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3054	19.5139	19.7727	20.0617	20.2718	20.3766	20.3932	20.3937	20.3592	20.1238	19.6709	19.2700 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9896	0.9781	0.9559	0.9067	0.8031	0.6127	0.4249	0.4475	0.6758	0.9015	0.9769	0.9919	(94)
Ext temp.	486.7309	550.4309	575.5361	556.7715	486.8454	353.5954	237.4563	249.1850	378.0466	479.1288	475.7857	462.8807	(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	973.3055	945.3453	856.3059	711.1024	544.8026	363.0851	238.4216	250.5009	395.1162	605.3139	802.8190	967.2396	(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	362.0116	265.3825	208.8927	111.1183	43.1202	0.0000	0.0000	0.0000	0.0000	93.8817	235.4639	375.2430	(98)
												1695.1139	(98)
												25.9152	(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													1812.9561 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	362.0116	265.3825	208.8927	111.1183	43.1202	0.0000	0.0000	0.0000	0.0000	93.8817	235.4639	375.2430	(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)	387.1781	283.8315	223.4147	118.8431	46.1179	0.0000	0.0000	0.0000	0.0000	100.4083	251.8331	401.3294	(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	187.5446	165.4370	174.0623	156.4750	153.6588	137.7574	132.7365	145.0531	144.6089	162.2340	170.9931	183.1807	(64)
Efficiency of water heater (217)m	86.5400	86.0684	85.3013	83.9201	81.9225	79.8000	79.8000	79.8000	79.8000	83.4151	85.6676	86.6871	(216)
Fuel for water heating, kWh/month	216.7142	192.2157	204.0558	186.4570	187.5661	172.6283	166.3365	181.7708	181.2141	194.4899	199.6006	211.3124	(219)
Water heating fuel used												2294.3614	(219)
Annual totals kWh/year													
Space heating fuel - main system												1812.9561	(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)												324.2098	(232)
Total delivered energy for all uses												4506.5272	(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	1812.9561	0.2160	391.5985 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2294.3614	0.2160	495.5821 (264)
Space and water heating			887.1806 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	324.2098	0.5190	168.2649 (268)
Total CO2, kg/m2/year			1094.3704 (272)
Emissions per m2 for space and water heating			13.5634 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.5725 (272b)
Emissions per m2 for pumps and fans			0.5951 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.5634 * 1.00) + 2.5725 + 0.5951, rounded to 2 d.p.			16.7300 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 11			Issued on Date	13/04/2022
Assessment Reference	Unit 11_Be Lean	Prop Type Ref	160 Malden Road		
Property	160, Malden Road				
SAP Rating	85 B	DER	14.01	TER	16.73
Environmental	90 B	% DER<TER	16.26		
CO ₂ Emissions (t/year)	0.80	DFEE	31.41	TFEE	38.03
General Requirements Compliance	Pass	% DFEE<TFEE	17.39		
Assessor Details	Mr. Andy Love, Love Design Studio Ltd, Tel: 07563755762, Mail@lovedesignstudio.co.uk			Assessor ID	U860-0001
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 65 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
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.73 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.01 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)38.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)31.4 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.23 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.100

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
x x

Efficiency: 90%
Minimum: 88% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage Nominal cylinder loss: 1.82 kWh/day
Permitted by DBSCG 2.10 OK
Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK
Independent timer for DHW OK

Boiler interlock Yes OK

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: 0.60
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 South: 8.01 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Roof U-value 0.12 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	65.4100 (1b)	x 2.7000 (2b)	= 176.6070 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.4100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.6070 (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) =												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
windows (Uw = 1.20)			8.0100	1.1450	9.1718		(27)
Half glazed doors			6.2900	1.2000	7.5480		(26a)
Solid Door			2.0500	1.4000	2.8700		(26)
External Wall 1	28.8000	14.3000	14.5000	0.1400	2.0300		(29a)
Corridor	8.4500	2.0500	6.4000	0.1342	0.8587		(29a)
stairs	14.5700		14.5700	0.1321	1.9240		(29a)
External Roof 1	7.3900		7.3900	0.1200	0.8868		(30)
Total net area of external elements Aum(A, m ²)			59.2100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.2893		(33)
Party Wall 1			72.7100	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K	250.0000 (35)
Thermal bridges (User defined value 0.100 * total exposed area)	5.9210 (36)
Total fabric heat loss	(33) + (36) = 31.2103 (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	16.5698	16.3841	16.1983	15.2694	15.0837	14.1548	14.1548	13.9691	14.5264	15.0837	15.4552	15.8267 (38)
Average = Sum(39)m / 12 =	47.7801	47.5943	47.4085	46.4797	46.2939	45.3651	45.3651	45.1793	45.7366	46.2939	46.6655	47.0370 (39)
	47.7801	47.5943	47.4085	46.4797	46.2939	45.3651	45.3651	45.1793	45.7366	46.2939	46.6655	46.4333 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7305	0.7276	0.7248	0.7106	0.7078	0.6935	0.6935	0.6907	0.6992	0.7078	0.7134	0.7191 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1298 (42)
Average daily hot water use (litres/day)												84.7818 (43)
Daily hot water use	Jan 93.2600	Feb 89.8687	Mar 86.4775	Apr 83.0862	May 79.6949	Jun 76.3037	Jul 76.3037	Aug 79.6949	Sep 83.0862	Oct 86.4775	Nov 89.8687	Dec 93.2600 (44)
Energy conte	138.3019	120.9597	124.8196	108.8208	104.4161	90.1032	83.4938	95.8104	96.9547	112.9913	123.3389	133.9380 (45)
Energy content (annual)										Total = Sum(45)m =		1333.9484 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	20.7453	18.1440	18.7229	16.3231	15.6624	13.5155	12.5241	14.3716	14.5432	16.9487	18.5008	20.0907 (46)
Water storage loss:												
Store volume												180.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0115 (51)
Volume factor from Table 2a												0.8736 (52)
Temperature factor from Table 2b												0.5400 (53)
Enter (49) or (54) in (55)												0.9805 (55)
Total storage loss	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (56)
If cylinder contains dedicated solar storage	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (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	191.9608	169.4258	178.4785	160.7487	158.0750	142.0311	137.1527	149.4693	148.8826	166.6502	175.2668	187.5969 (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	191.9608	169.4258	178.4785	160.7487	158.0750	142.0311	137.1527	149.4693	148.8826	166.6502	175.2668	187.5969 (64)
Heat gains from water heating, kWh/month	88.9125	78.9920	84.4296	77.7253	77.6455	71.5017	70.6888	74.7841	73.7798	80.4967	82.5525	87.4615 (65)
Solar input (sum of months) = Sum(63)m =												
Total per year (kWh/year) = Sum(64)m =												

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	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3581	16.3055	13.2605	10.0391	7.5043	6.3355	6.8457	8.8983	11.9433	15.1647	17.6995	18.8683 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	186.3568	188.2906	183.4175	173.0432	159.9476	147.6395	139.4169	137.4831	142.3562	152.7305	165.8262	178.1343 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488 (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)	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905 (71)
Water heating gains (Table 5)	119.5060	117.5476	113.4807	107.9518	104.3622	99.3079	95.0118	100.5162	102.4719	108.1945	114.6563	117.5558 (72)
Total internal gains	382.1674	380.0902	368.1052	348.9805	329.7605	311.2292	299.2209	304.8441	314.7179	334.0362	356.1284	372.5048 (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		
South				8.0100	46.7521	0.6300	0.7000		0.7700	114.4472 (78)		
Solar gains	114.4472	187.4350	238.7590	269.8494	281.1998	270.6166	264.4089	256.7776	249.4119	202.1662	135.6590	98.8929 (83)
Total gains	496.6146	567.5252	606.8641	618.8299	610.9603	581.8458	563.6297	561.6217	564.1298	536.2024	491.7873	471.3977 (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	95.0681	95.4392	95.8131	97.7278	98.1200	100.1290	100.1290	100.5407	99.3156	98.1200	97.3388	96.5699
alpha	7.3379	7.3626	7.3875	7.5152	7.5413	7.6753	7.6753	7.7027	7.6210	7.5413	7.4893	7.4380
util living area	0.9881	0.9691	0.9280	0.8363	0.6890	0.4978	0.3541	0.3699	0.5564	0.8302	0.9664	0.9912 (86)
MIT	20.5224	20.6635	20.8067	20.9300	20.9851	20.9989	20.9999	20.9999	20.9974	20.9433	20.7295	20.4968 (87)
Th 2	20.3140	20.3165	20.3190	20.3315	20.3340	20.3465	20.3465	20.3490	20.3415	20.3340	20.3290	20.3240 (88)
util rest of house	0.9849	0.9613	0.9116	0.8055	0.6447	0.4475	0.3015	0.3176	0.5046	0.7937	0.9567	0.9888 (89)
MIT 2	19.6855	19.8878	20.0867	20.2564	20.3208	20.3458	20.3465	20.3490	20.3397	20.2767	19.9935	19.6569 (90)
Living area fraction	19.9498	20.1328	20.3141	20.4691	20.5306	20.5521	20.5529	20.5546	20.5474	20.4873	20.2260	19.9222 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.7998	19.9828	20.1641	20.3191	20.3806	20.4021	20.4029	20.4046	20.3974	20.3373	20.0760	19.7722 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9818	0.9568	0.9075	0.8049	0.6479	0.4518	0.3061	0.3221	0.5091	0.7939	0.9523	0.9862 (94)
Ext temp.	487.5769	543.0233	550.7053	498.0915	395.8514	262.8859	172.5051	180.9050	287.1813	425.6722	468.3298	464.9057 (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	740.5824	717.8562	647.7957	530.7572	401.8583	263.2133	172.5186	180.9249	288.0236	450.7758	605.5289	732.4695 (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	188.2361	117.4877	72.2353	23.5193	4.4691	0.0000	0.0000	0.0000	0.0000	18.6771	98.7834	199.0675 (98)
Space heating per m2												722.4754 (98)
(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

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 %)													89.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													807.2351 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	188.2361	117.4877	72.2353	23.5193	4.4691	0.0000	0.0000	0.0000	0.0000	18.6771	98.7834	199.0675	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	210.3197	131.2712	80.7098	26.2785	4.9934	0.0000	0.0000	0.0000	0.0000	20.8683	110.3725	222.4217	(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	191.9608	169.4258	178.4785	160.7487	158.0750	142.0311	137.1527	149.4693	148.8826	166.6502	175.2668	187.5969	(64)
Efficiency of water heater (217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(216)
Fuel for water heating, kWh/month	214.4813	189.3026	199.4173	179.6075	176.6201	158.6940	153.2433	167.0048	166.3493	186.2013	195.8288	209.6055	(219)
Water heating fuel used												2196.3559	(219)
Annual totals kWh/year													
Space heating fuel - main system												807.2351	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)													161.5954 (230a)
central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													191.5954 (231)
Electricity for lighting (calculated in Appendix L)													324.2098 (232)
Total delivered energy for all uses													3519.3961 (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	807.2351	0.2160	174.3628 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2196.3559	0.2160	474.4129 (264)
Space and water heating			648.7756 (265)
Pumps and fans	191.5954	0.5190	99.4380 (267)
Energy for lighting	324.2098	0.5190	168.2649 (268)
Total CO2, kg/year			916.4785 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.0100 (273)

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

DER		14.0100	ZC1
Total Floor Area		65.4100	
Assumed number of occupants		2.1298	
CO2 emission factor in Table 12 for electricity displaced from grid		0.5190	
CO2 emissions from appliances, equation (L14)		16.8829	ZC2
CO2 emissions from cooking, equation (L16)		2.6007	ZC3
Total CO2 emissions		33.4937	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		33.4937	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	65.4100 (1b)	x 2.7000 (2b)	= 176.6070 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.4100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.6070 (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) = 0.1132 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3632 (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) =				0.3088 (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	0.3937	0.3859	0.3782	0.3396	0.3319	0.2933	0.2933	0.2856	0.3088	0.3319	0.3474	0.3628 (22b)
Effective ac	0.5775	0.5745	0.5715	0.5577	0.5551	0.5430	0.5430	0.5408	0.5477	0.5551	0.5603	0.5658 (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			2.0500	1.0000	2.0500		(26)
TER Semi-glazed door			6.2900	1.2000	7.5480		(26a)
TER Opening Type (Uw = 1.40)			8.0100	1.3258	10.6193		(27)
External Wall 1	28.8000	14.3000	14.5000	0.1800	2.6100		(29a)
Corridor	8.4500	2.0500	6.4000	0.1800	1.1520		(29a)
stairs	14.5700		14.5700	0.1800	2.6226		(29a)
External Roof 1	7.3900		7.3900	0.1300	0.9607		(30)
Total net area of external elements Aum(A, m ²)			59.2100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.5626		(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)							3.6448 (36)
Total fabric heat loss						(33) + (36) =	31.2074 (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	33.6561	33.4808	33.3089	32.5015	32.3505	31.6473	31.6473	31.5171	31.9181	32.3505	32.6561	32.9755 (38)
Heat transfer coeff	64.8635	64.6882	64.5163	63.7089	63.5579	62.8547	62.8547	62.7245	63.1256	63.5579	63.8635	64.1829 (39)
Average = Sum(39)m / 12 =												63.7082 (39)
HLP	0.9916	0.9890	0.9863	0.9740	0.9717	0.9609	0.9609	0.9589	0.9651	0.9717	0.9764	0.9812 (40)
HLP (average)												0.9740 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1298 (42)
Average daily hot water use (litres/day)												84.7818 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	93.2600	89.8687	86.4775	83.0862	79.6949	76.3037	76.3037	79.6949	83.0862	86.4775	89.8687	93.2600 (44)
Energy content (annual)	138.3019	120.9597	124.8196	108.8208	104.4161	90.1032	83.4938	95.8104	96.9547	112.9913	123.3389	133.9380 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1333.9484 (45)
Water storage loss:	20.7453	18.1440	18.7229	16.3231	15.6624	13.5155	12.5241	14.3716	14.5432	16.9487	18.5008	20.0907 (46)
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (48)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8381 (55)
Total storage loss												
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(56)
If cylinder contains dedicated solar storage												
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(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												
187.5446	165.4370	174.0623	156.4750	153.6588	137.7574	132.7365	145.0531	144.6089	162.2340	170.9931	183.1807	(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												
187.5446	165.4370	174.0623	156.4750	153.6588	137.7574	132.7365	145.0531	144.6089	162.2340	170.9931	183.1807	(64)
Heat gains from water heating, kWh/month												
85.3795	75.8009	80.8967	74.3063	74.1125	68.0827	67.1558	71.2511	70.3608	76.9638	79.1335	83.9285	(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	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
18.3581	16.3055	13.2605	10.0391	7.5043	6.3355	6.8457	8.8983	11.9433	15.1647	17.6995	18.8683	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
186.3568	188.2906	183.4175	173.0432	159.9476	147.6395	139.4169	137.4831	142.3562	152.7305	165.8262	178.1343	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	(71)
Water heating gains (Table 5)												
114.7574	112.7990	108.7321	103.2031	99.6136	94.5593	90.2632	95.7676	97.7233	103.4459	109.9077	112.8072	(72)
Total internal gains												
377.4188	375.3416	363.3565	344.2319	325.0119	306.4806	294.4723	300.0954	309.9692	329.2876	351.3798	367.7562	(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			

South					8.0100	46.7521	0.6300	0.7000	0.7700	114.4472 (78)			

Solar gains	114.4472	187.4350	238.7590	269.8494	281.1998	270.6166	264.4089	256.7776	249.4119	202.1662	135.6590	98.8929	(83)
Total gains	491.8660	562.7766	602.1155	614.0813	606.2117	577.0972	558.8811	556.8731	559.3812	531.4538	487.0387	466.6491	(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	70.0295	70.2193	70.4064	71.2986	71.4681	72.2676	72.2676	72.4177	71.9576	71.4681	71.1261	70.7721
alpha	5.6686	5.6813	5.6938	5.7532	5.7645	5.8178	5.8178	5.8278	5.7972	5.7645	5.7417	5.7181
util living area	0.9938	0.9858	0.9694	0.9299	0.8412	0.6688	0.4906	0.5127	0.7292	0.9277	0.9854	0.9953 (86)
MIT	20.1212	20.2801	20.4794	20.7036	20.8796	20.9757	20.9965	20.9955	20.9589	20.7508	20.3954	20.0907 (87)
Th 2	20.0903	20.0925	20.0947	20.1051	20.1070	20.1160	20.1160	20.1177	20.1125	20.1070	20.1031	20.0990 (88)
util rest of house	0.9918	0.9816	0.9599	0.9079	0.7935	0.5880	0.3943	0.4172	0.6537	0.9010	0.9801	0.9938 (89)
MIT 2	18.9288	19.1601	19.4465	19.7654	19.9911	20.1000	20.1147	20.1158	20.0823	19.8344	19.3364	18.8912 (90)
Living area fraction	19.3054	19.5139	19.7727	20.0617	20.2718	20.3766	20.3932	20.3937	20.3592	20.1238	19.6709	19.2700 (91)
MIT	19.3054	19.5139	19.7727	20.0617	20.2718	20.3766	20.3932	20.3937	20.3592	20.1238	19.6709	19.2700 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3054	19.5139	19.7727	20.0617	20.2718	20.3766	20.3932	20.3937	20.3592	20.1238	19.6709	19.2700 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9896	0.9781	0.9559	0.9067	0.8031	0.6127	0.4249	0.4475	0.6758	0.9015	0.9769	0.9919	(94)
Ext temp.	486.7309	550.4309	575.5361	556.7715	486.8454	353.5954	237.4563	249.1850	378.0466	479.1288	475.7857	462.8807	(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	973.3055	945.3453	856.3059	711.1024	544.8026	363.0851	238.4216	250.5009	395.1162	605.3139	802.8190	967.2396	(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	362.0116	265.3825	208.8927	111.1183	43.1202	0.0000	0.0000	0.0000	0.0000	93.8817	235.4639	375.2430	(98)
												1695.1139	(98)
												25.9152	(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													1812.9561 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	362.0116	265.3825	208.8927	111.1183	43.1202	0.0000	0.0000	0.0000	0.0000	93.8817	235.4639	375.2430	(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)	387.1781	283.8315	223.4147	118.8431	46.1179	0.0000	0.0000	0.0000	0.0000	100.4083	251.8331	401.3294	(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	187.5446	165.4370	174.0623	156.4750	153.6588	137.7574	132.7365	145.0531	144.6089	162.2340	170.9931	183.1807	(64)
Efficiency of water heater (217)m	86.5400	86.0684	85.3013	83.9201	81.9225	79.8000	79.8000	79.8000	79.8000	83.4151	85.6676	86.6871	(216)
Fuel for water heating, kWh/month	216.7142	192.2157	204.0558	186.4570	187.5661	172.6283	166.3365	181.7708	181.2141	194.4899	199.6006	211.3124	(219)
Water heating fuel used												2294.3614	(219)
Annual totals kWh/year													
Space heating fuel - main system												1812.9561	(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)												324.2098	(232)
Total delivered energy for all uses												4506.5272	(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	1812.9561	0.2160	391.5985 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2294.3614	0.2160	495.5821 (264)
Space and water heating			887.1806 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	324.2098	0.5190	168.2649 (268)
Total CO2, kg/m2/year			1094.3704 (272)
Emissions per m2 for space and water heating			13.5634 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.5725 (272b)
Emissions per m2 for pumps and fans			0.5951 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.5634 * 1.00) + 2.5725 + 0.5951, rounded to 2 d.p.			16.7300 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 11			Issued on Date	13/04/2022
Assessment Reference	Unit 11_Be Lean	Prop Type Ref	160 Malden Road		
Property	160, Malden Road				
SAP Rating	85 B	DER	14.01	TER	16.73
Environmental	90 B	% DER<TER	16.26		
CO ₂ Emissions (t/year)	0.80	DFEE	31.41	TFEE	38.03
General Requirements Compliance	Pass	% DFEE<TFEE	17.39		
Assessor Details	Mr. Andy Love, Love Design Studio Ltd, Tel: 07563755762, Mail@lovedesignstudio.co.uk			Assessor ID	U860-0001
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 65 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
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.73 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.01 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)38.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)31.4 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.23 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.100

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
x x

Efficiency: 90%
Minimum: 88% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage Nominal cylinder loss: 1.82 kWh/day
Permitted by DBSCG 2.10 OK
Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK
Independent timer for DHW OK

Boiler interlock Yes OK

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: 0.60
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 South: 8.01 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Roof U-value 0.12 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	65.4100 (1b)	x 2.7000 (2b)	= 176.6070 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.4100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.6070 (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) =												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
windows (Uw = 1.20)			8.0100	1.1450	9.1718		(27)
Half glazed doors			6.2900	1.2000	7.5480		(26a)
Solid Door			2.0500	1.4000	2.8700		(26)
External Wall 1	28.8000	14.3000	14.5000	0.1400	2.0300		(29a)
Corridor	8.4500	2.0500	6.4000	0.1342	0.8587		(29a)
stairs	14.5700		14.5700	0.1321	1.9240		(29a)
External Roof 1	7.3900		7.3900	0.1200	0.8868		(30)
Total net area of external elements Aum(A, m ²)			59.2100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.2893		(33)
Party Wall 1			72.7100	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K	250.0000 (35)
Thermal bridges (User defined value 0.100 * total exposed area)	5.9210 (36)
Total fabric heat loss	(33) + (36) = 31.2103 (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	16.5698	16.3841	16.1983	15.2694	15.0837	14.1548	14.1548	13.9691	14.5264	15.0837	15.4552	15.8267 (38)
Heat transfer coeff	47.7801	47.5943	47.4085	46.4797	46.2939	45.3651	45.3651	45.1793	45.7366	46.2939	46.6655	47.0370 (39)
Average = Sum(39)m / 12 =												46.4333 (39)
HLP	0.7305	0.7276	0.7248	0.7106	0.7078	0.6935	0.6935	0.6907	0.6992	0.7078	0.7134	0.7191 (40)
HLP (average)												0.7099 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

												2.1298 (42)
Assumed occupancy												
Average daily hot water use (litres/day)												84.7818 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	93.2600	89.8687	86.4775	83.0862	79.6949	76.3037	76.3037	79.6949	83.0862	86.4775	89.8687	93.2600 (44)
Energy content	138.3019	120.9597	124.8196	108.8208	104.4161	90.1032	83.4938	95.8104	96.9547	112.9913	123.3389	133.9380 (45)
Energy content (annual)										Total = Sum(45)m =		1333.9484 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	20.7453	18.1440	18.7229	16.3231	15.6624	13.5155	12.5241	14.3716	14.5432	16.9487	18.5008	20.0907 (46)
Water storage loss:												
Store volume												180.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0115 (51)
Volume factor from Table 2a												0.8736 (52)
Temperature factor from Table 2b												0.5400 (53)
Enter (49) or (54) in (55)												0.9805 (55)
Total storage loss	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (56)
If cylinder contains dedicated solar storage	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (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	191.9608	169.4258	178.4785	160.7487	158.0750	142.0311	137.1527	149.4693	148.8826	166.6502	175.2668	187.5969 (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	191.9608	169.4258	178.4785	160.7487	158.0750	142.0311	137.1527	149.4693	148.8826	166.6502	175.2668	187.5969 (64)
Heat gains from water heating, kWh/month	88.9125	78.9920	84.4296	77.7253	77.6455	71.5017	70.6888	74.7841	73.7798	80.4967	82.5525	87.4615 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1965.7385 (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	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3581	16.3055	13.2605	10.0391	7.5043	6.3355	6.8457	8.8983	11.9433	15.1647	17.6995	18.8683 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	186.3568	188.2906	183.4175	173.0432	159.9476	147.6395	139.4169	137.4831	142.3562	152.7305	165.8262	178.1343 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488 (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)	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905 (71)
Water heating gains (Table 5)	119.5060	117.5476	113.4807	107.9518	104.3622	99.3079	95.0118	100.5162	102.4719	108.1945	114.6563	117.5558 (72)
Total internal gains	382.1674	380.0902	368.1052	348.9805	329.7605	311.2292	299.2209	304.8441	314.7179	334.0362	356.1284	372.5048 (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		
South				8.0100	46.7521	0.6300	0.7000		0.7700	114.4472 (78)		
Solar gains	114.4472	187.4350	238.7590	269.8494	281.1998	270.6166	264.4089	256.7776	249.4119	202.1662	135.6590	98.8929 (83)
Total gains	496.6146	567.5252	606.8641	618.8299	610.9603	581.8458	563.6297	561.6217	564.1298	536.2024	491.7873	471.3977 (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	95.0681	95.4392	95.8131	97.7278	98.1200	100.1290	100.1290	100.5407	99.3156	98.1200	97.3388	96.5699
alpha	7.3379	7.3626	7.3875	7.5152	7.5413	7.6753	7.6753	7.7027	7.6210	7.5413	7.4893	7.4380
util living area	0.9881	0.9691	0.9280	0.8363	0.6890	0.4978	0.3541	0.3699	0.5564	0.8302	0.9664	0.9912 (86)
MIT	20.5224	20.6635	20.8067	20.9300	20.9851	20.9989	20.9999	20.9999	20.9974	20.9433	20.7295	20.4968 (87)
Th 2	20.3140	20.3165	20.3190	20.3315	20.3340	20.3465	20.3465	20.3490	20.3415	20.3340	20.3290	20.3240 (88)
util rest of house	0.9849	0.9613	0.9116	0.8055	0.6447	0.4475	0.3015	0.3176	0.5046	0.7937	0.9567	0.9888 (89)
MIT 2	19.6855	19.8878	20.0867	20.2564	20.3208	20.3458	20.3465	20.3490	20.3397	20.2767	19.9935	19.6569 (90)
Living area fraction	19.9498	20.1328	20.3141	20.4691	20.5306	20.5521	20.5529	20.5546	20.5474	20.4873	20.2260	19.9222 (92)
Temperature adjustment												-0.1500
adjusted MIT	19.7998	19.9828	20.1641	20.3191	20.3806	20.4021	20.4029	20.4046	20.3974	20.3373	20.0760	19.7722 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9818	0.9568	0.9075	0.8049	0.6479	0.4518	0.3061	0.3221	0.5091	0.7939	0.9523	0.9862 (94)
Useful gains	487.5769	543.0233	550.7053	498.0915	395.8514	262.8859	172.5051	180.9050	287.1813	425.6722	468.3298	464.9057 (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	740.5824	717.8562	647.7957	530.7572	401.8583	263.2133	172.5186	180.9249	288.0236	450.7758	605.5289	732.4695 (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	188.2361	117.4877	72.2353	23.5193	4.4691	0.0000	0.0000	0.0000	0.0000	18.6771	98.7834	199.0675 (98)
Space heating												722.4754 (98)
Space heating per m2										(98) / (4) =		11.0453 (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

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 %)													89.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													807.2351 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	188.2361	117.4877	72.2353	23.5193	4.4691	0.0000	0.0000	0.0000	0.0000	18.6771	98.7834	199.0675	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	210.3197	131.2712	80.7098	26.2785	4.9934	0.0000	0.0000	0.0000	0.0000	20.8683	110.3725	222.4217	(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	191.9608	169.4258	178.4785	160.7487	158.0750	142.0311	137.1527	149.4693	148.8826	166.6502	175.2668	187.5969	(64)
Efficiency of water heater (217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(216)
Fuel for water heating, kWh/month	214.4813	189.3026	199.4173	179.6075	176.6201	158.6940	153.2433	167.0048	166.3493	186.2013	195.8288	209.6055	(219)
Water heating fuel used												2196.3559	(219)
Annual totals kWh/year													
Space heating fuel - main system												807.2351	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)													161.5954 (230a)
central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													191.5954 (231)
Electricity for lighting (calculated in Appendix L)													324.2098 (232)
Total delivered energy for all uses													3519.3961 (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	807.2351	0.2160	174.3628 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2196.3559	0.2160	474.4129 (264)
Space and water heating			648.7756 (265)
Pumps and fans	191.5954	0.5190	99.4380 (267)
Energy for lighting	324.2098	0.5190	168.2649 (268)
Total CO2, kg/year			916.4785 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			14.0100 (273)

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

DER		14.0100 ZC1
Total Floor Area	TFA	65.4100
Assumed number of occupants	N	2.1298
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		16.8829 ZC2
CO2 emissions from cooking, equation (L16)		2.6007 ZC3
Total CO2 emissions		33.4937 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		33.4937 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	65.4100 (1b)	x 2.7000 (2b)	= 176.6070 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.4100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 176.6070 (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) = 0.1132 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3632 (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) =				0.3088 (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	0.3937	0.3859	0.3782	0.3396	0.3319	0.2933	0.2933	0.2856	0.3088	0.3319	0.3474	0.3628 (22b)
Effective ac	0.5775	0.5745	0.5715	0.5577	0.5551	0.5430	0.5430	0.5408	0.5477	0.5551	0.5603	0.5658 (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			2.0500	1.0000	2.0500		(26)
TER Semi-glazed door			6.2900	1.2000	7.5480		(26a)
TER Opening Type (Uw = 1.40)			8.0100	1.3258	10.6193		(27)
External Wall 1	28.8000	14.3000	14.5000	0.1800	2.6100		(29a)
Corridor	8.4500	2.0500	6.4000	0.1800	1.1520		(29a)
stairs	14.5700		14.5700	0.1800	2.6226		(29a)
External Roof 1	7.3900		7.3900	0.1300	0.9607		(30)
Total net area of external elements Aum(A, m ²)			59.2100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	27.5626		(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)							3.6448 (36)
Total fabric heat loss						(33) + (36) =	31.2074 (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	33.6561	33.4808	33.3089	32.5015	32.3505	31.6473	31.6473	31.5171	31.9181	32.3505	32.6561	32.9755 (38)
Heat transfer coeff	64.8635	64.6882	64.5163	63.7089	63.5579	62.8547	62.8547	62.7245	63.1256	63.5579	63.8635	64.1829 (39)
Average = Sum(39)m / 12 =												63.7082 (39)
HLP	0.9916	0.9890	0.9863	0.9740	0.9717	0.9609	0.9609	0.9589	0.9651	0.9717	0.9764	0.9812 (40)
HLP (average)												0.9740 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1298 (42)
Average daily hot water use (litres/day)												84.7818 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	93.2600	89.8687	86.4775	83.0862	79.6949	76.3037	76.3037	79.6949	83.0862	86.4775	89.8687	93.2600 (44)
Energy content (annual)	138.3019	120.9597	124.8196	108.8208	104.4161	90.1032	83.4938	95.8104	96.9547	112.9913	123.3389	133.9380 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1333.9484 (45)
Water storage loss:	20.7453	18.1440	18.7229	16.3231	15.6624	13.5155	12.5241	14.3716	14.5432	16.9487	18.5008	20.0907 (46)
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (48)

Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												0.8381 (55)	
Total storage loss													
	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)	
If cylinder contains dedicated solar storage													
	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (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													
	187.5446	165.4370	174.0623	156.4750	153.6588	137.7574	132.7365	145.0531	144.6089	162.2340	170.9931	183.1807 (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													
	187.5446	165.4370	174.0623	156.4750	153.6588	137.7574	132.7365	145.0531	144.6089	162.2340	170.9931	183.1807 (64)	
								Total per year (kWh/year) = Sum(64)m =					1913.7412 (64)
Heat gains from water heating, kWh/month													
	85.3795	75.8009	80.8967	74.3063	74.1125	68.0827	67.1558	71.2511	70.3608	76.9638	79.1335	83.9285 (65)	

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881	106.4881 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.3581	16.3055	13.2605	10.0391	7.5043	6.3355	6.8457	8.8983	11.9433	15.1647	17.6995	18.8683 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	186.3568	188.2906	183.4175	173.0432	159.9476	147.6395	139.4169	137.4831	142.3562	152.7305	165.8262	178.1343 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488	33.6488 (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)	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905	-85.1905 (71)
Water heating gains (Table 5)	114.7574	112.7990	108.7321	103.2031	99.6136	94.5593	90.2632	95.7676	97.7233	103.4459	109.9077	112.8072 (72)
Total internal gains	377.4188	375.3416	363.3565	344.2319	325.0119	306.4806	294.4723	300.0954	309.9692	329.2876	351.3798	367.7562 (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			
South				8.0100	46.7521	0.6300	0.7000	0.7700	114.4472 (78)			
Solar gains	114.4472	187.4350	238.7590	269.8494	281.1998	270.6166	264.4089	256.7776	249.4119	202.1662	135.6590	98.8929 (83)
Total gains	491.8660	562.7766	602.1155	614.0813	606.2117	577.0972	558.8811	556.8731	559.3812	531.4538	487.0387	466.6491 (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	70.0295	70.2193	70.4064	71.2986	71.4681	72.2676	72.2676	72.4177	71.9576	71.4681	71.1261	70.7721
alpha	5.6686	5.6813	5.6938	5.7532	5.7645	5.8178	5.8178	5.8278	5.7972	5.7645	5.7417	5.7181
util living area	0.9938	0.9858	0.9694	0.9299	0.8412	0.6688	0.4906	0.5127	0.7292	0.9277	0.9854	0.9953 (86)
MIT	20.1212	20.2801	20.4794	20.7036	20.8796	20.9757	20.9965	20.9955	20.9589	20.7508	20.3954	20.0907 (87)
Th 2	20.0903	20.0925	20.0947	20.1051	20.1070	20.1160	20.1160	20.1177	20.1125	20.1070	20.1031	20.0990 (88)
util rest of house	0.9918	0.9816	0.9599	0.9079	0.7935	0.5880	0.3943	0.4172	0.6537	0.9010	0.9801	0.9938 (89)
MIT 2	18.9288	19.1601	19.4465	19.7654	19.9911	20.1000	20.1147	20.1158	20.0823	19.8344	19.3364	18.8912 (90)
Living area fraction									fLA = Living area / (4) =			0.3159 (91)
MIT	19.3054	19.5139	19.7727	20.0617	20.2718	20.3766	20.3932	20.3937	20.3592	20.1238	19.6709	19.2700 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3054	19.5139	19.7727	20.0617	20.2718	20.3766	20.3932	20.3937	20.3592	20.1238	19.6709	19.2700 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9896	0.9781	0.9559	0.9067	0.8031	0.6127	0.4249	0.4475	0.6758	0.9015	0.9769	0.9919 (94)
Useful gains	486.7309	550.4309	575.5361	556.7715	486.8454	353.5954	237.4563	249.1850	378.0466	479.1288	475.7857	462.8807 (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	973.3055	945.3453	856.3059	711.1024	544.8026	363.0851	238.4216	250.5009	395.1162	605.3139	802.8190	967.2396 (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	362.0116	265.3825	208.8927	111.1183	43.1202	0.0000	0.0000	0.0000	0.0000	93.8817	235.4639	375.2430 (98)
Space heating												1695.1139 (98)
Space heating per m2										(98) / (4) =		25.9152 (99)

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													1812.9561 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	362.0116	265.3825	208.8927	111.1183	43.1202	0.0000	0.0000	0.0000	0.0000	93.8817	235.4639	375.2430	(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)	387.1781	283.8315	223.4147	118.8431	46.1179	0.0000	0.0000	0.0000	0.0000	100.4083	251.8331	401.3294	(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	187.5446	165.4370	174.0623	156.4750	153.6588	137.7574	132.7365	145.0531	144.6089	162.2340	170.9931	183.1807	(64)
Efficiency of water heater (217)m	86.5400	86.0684	85.3013	83.9201	81.9225	79.8000	79.8000	79.8000	79.8000	83.4151	85.6676	86.6871	(216)
Fuel for water heating, kWh/month	216.7142	192.2157	204.0558	186.4570	187.5661	172.6283	166.3365	181.7708	181.2141	194.4899	199.6006	211.3124	(219)
Water heating fuel used												2294.3614	(219)
Annual totals kWh/year													
Space heating fuel - main system												1812.9561	(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)												324.2098	(232)
Total delivered energy for all uses												4506.5272	(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	1812.9561	0.2160	391.5985 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2294.3614	0.2160	495.5821 (264)
Space and water heating			887.1806 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	324.2098	0.5190	168.2649 (268)
Total CO2, kg/m2/year			1094.3704 (272)
Emissions per m2 for space and water heating			13.5634 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.5725 (272b)
Emissions per m2 for pumps and fans			0.5951 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.5634 * 1.00) + 2.5725 + 0.5951, rounded to 2 d.p.			16.7300 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 12			Issued on Date	13/04/2022
Assessment Reference	Unit 12_Be Green	Prop Type Ref	160 Malden Road		
Property	160, Malden Road				
SAP Rating	88 B	DER	16.41	TER	29.37
Environmental	89 B	% DER<TER	44.13		
CO ₂ Emissions (t/year)	0.77	DFEE	46.85	TFEE	53.85
General Requirements Compliance	Pass	% DFEE<TFEE	13.00		
Assessor Details	Mr. Andy Love, Love Design Studio Ltd, Tel: 07563755762, Mail@lovedesignstudio.co.uk			Assessor ID	U860-0001
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 61 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
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 29.37 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.41 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 53.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 46.8 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.22 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified ψ -value of 0.100

3 Air permeability

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

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric
Air-to-water heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water storage: Nominal cylinder loss: 1.82 kWh/day
Permitted by DBSCG 2.10 OK
Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

Cylinderstat OK
Independent timer for DHW OK

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: 0.60
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: 2.70 m², No overhang
Windows facing East: 6.07 m², No overhang
Windows facing South: 2.02 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Roof U-value 0.12 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.68 kW

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	61.0300 (1b)	x 2.7000 (2b)	= 164.7810 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 164.7810 (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					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (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	0.2987	0.2952	0.2917	0.2744	0.2709	0.2536	0.2536	0.2501	0.2605	0.2709	0.2778	0.2848 (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
windows (Uw = 1.20)			10.7900	1.1450	12.3550		(27)
Half glazed doors			6.2900	1.2000	7.5480		(26a)
Solid Door			2.0500	1.4000	2.8700		(26)
External Wall 1	72.5200	17.0800	55.4400	0.1400	7.7616		(29a)
Corridor	4.0500	2.0500	2.0000	0.1342	0.2684		(29a)
External Roof 1	21.8200		21.8200	0.1200	2.6184		(30)
Total net area of external elements Aum(A, m ²)			98.3900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	33.4213		(33)
Party Wall 1			28.0700	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K	250.0000 (35)
Thermal bridges (User defined value 0.100 * total exposed area)	9.8390 (36)
Total fabric heat loss	(33) + (36) = 43.2603 (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	16.2402	16.0516	15.8630	14.9199	14.7313	13.7882	13.7882	13.5995	14.1654	14.7313	15.1085	15.4858 (38)
Heat transfer coeff	59.5006	59.3119	59.1233	58.1802	57.9916	57.0485	57.0485	56.8598	57.4257	57.9916	58.3688	58.7461 (39)
Average = Sum(39)m / 12 =												58.1330 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9749	0.9718	0.9688	0.9533	0.9502	0.9348	0.9348	0.9317	0.9409	0.9502	0.9564	0.9626 (40)
HLP (average)												0.9525 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0106 (42)
Average daily hot water use (litres/day)												81.9518 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	90.1470	86.8689	83.5908	80.3128	77.0347	73.7566	73.7566	77.0347	80.3128	83.5908	86.8689	90.1470 (44)
Energy conte	133.6854	116.9221	120.6531	105.1883	100.9307	87.0955	80.7068	92.6122	93.7183	109.2196	119.2218	129.4671 (45)
Energy content (annual)										Total = Sum (45)m =		1289.4209 (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

	20.0528	17.5383	18.0980	15.7782	15.1396	13.0643	12.1060	13.8918	14.0577	16.3829	17.8833	19.4201 (46)
Water storage loss:												
Store volume												180.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0115 (51)
Volume factor from Table 2a												0.8736 (52)
Temperature factor from Table 2b												0.5400 (53)
Enter (49) or (54) in (55)												0.9805 (55)
Total storage loss												
30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965	(56)
If cylinder contains dedicated solar storage												
30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965	(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												
187.3442	165.3882	174.3120	157.1162	154.5896	139.0235	134.3657	146.2711	145.6462	162.8785	171.1497	183.1260	(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												
187.3442	165.3882	174.3120	157.1162	154.5896	139.0235	134.3657	146.2711	145.6462	162.8785	171.1497	183.1260	(64)
Heat gains from water heating, kWh/month												
87.3775	77.6495	83.0443	76.5175	76.4866	70.5016	69.7621	73.7207	72.7037	79.2426	81.1836	85.9749	(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	
100.5301	100.5301	100.5301	100.5301	100.5301	100.5301	100.5301	100.5301	100.5301	100.5301	100.5301	100.5301	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
16.0304	14.2380	11.5791	8.7662	6.5528	5.5322	5.9777	7.7700	10.4289	13.2419	15.4552	16.4759	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
175.5369	177.3585	172.7683	162.9963	150.6610	139.0675	131.3224	129.5008	134.0910	143.8630	156.1983	167.7918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
33.0530	33.0530	33.0530	33.0530	33.0530	33.0530	33.0530	33.0530	33.0530	33.0530	33.0530	33.0530	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	(71)
Water heating gains (Table 5)												
117.4429	115.5498	111.6186	106.2743	102.8045	97.9189	93.7663	99.0869	100.9774	106.5089	112.7550	115.5577	(72)
Total internal gains												
365.1692	363.3053	352.1251	334.1958	316.1773	298.6776	287.2254	292.5168	301.6563	319.7728	340.5676	355.9844	(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				2.7000	10.6334	0.6300	0.7000	0.7700		8.7742 (74)		
East				6.0700	19.6403	0.6300	0.7000	0.7700		36.4341 (76)		
South				2.0200	46.7521	0.6300	0.7000	0.7700		28.8618 (78)		
Solar gains	74.0701	135.3090	206.0803	285.0048	342.3614	349.0082	332.7623	289.2732	233.6688	155.5145	90.4642	62.2155 (83)
Total gains	439.2393	498.6143	558.2054	619.2006	658.5387	647.6858	619.9877	581.7900	535.3251	475.2873	431.0318	418.1999 (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	71.2295	71.4560	71.6840	72.8460	73.0829	74.2911	74.5376	73.8031	73.0829	72.6106	72.1443	
alpha	5.7486	5.7637	5.7789	5.8564	5.8722	5.9527	5.9692	5.9202	5.8722	5.8407	5.8096	
util living area	0.9949	0.9886	0.9691	0.9029	0.7575	0.5555	0.4038	0.4475	0.7032	0.9350	0.9882	0.9961 (86)
MIT	20.1151	20.2652	20.4966	20.7688	20.9354	20.9914	20.9989	20.9980	20.9683	20.7465	20.3853	20.0912 (87)
Th 2	20.1043	20.1069	20.1094	20.1224	20.1250	20.1381	20.1381	20.1407	20.1328	20.1250	20.1198	20.1146 (88)
util rest of house	0.9933	0.9850	0.9596	0.8758	0.7038	0.4843	0.3253	0.3650	0.6289	0.9104	0.9839	0.9948 (89)
MIT 2	18.9307	19.1499	19.4825	19.8638	20.0664	20.1327	20.1377	20.1399	20.1099	19.8451	19.3352	18.9038 (90)
Living area fraction	19.3264	19.5225	19.8213	20.1662	20.3567	20.4196	20.4254	20.4266	20.3967	20.1463	19.6860	19.3005 (91)
MIT	19.3264	19.5225	19.8213	20.1662	20.3567	20.4196	20.4254	20.4266	20.3967	20.1463	19.6860	19.3005 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3264	19.5225	19.8213	20.1662	20.3567	20.4196	20.4254	20.4266	20.3967	20.1463	19.6860	19.3005 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9914	0.9821	0.9559	0.8773	0.7188	0.5079	0.3515	0.3926	0.6525	0.9111	0.9812	0.9933 (94)
Useful gains	435.4521	489.6804	533.5828	543.2280	473.3295	328.9413	217.9500	228.4198	349.2780	433.0120	422.9085	415.3832 (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	894.0809	867.2915	787.5996	655.4674	502.0163	332.0003	218.2328	228.9514	361.5931	553.6024	734.6305	887.0961 (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	341.2198	253.7546	188.9885	80.8124	21.3429	0.0000	0.0000	0.0000	0.0000	89.7192	224.4398	350.9544 (98)
Space heating												1551.2317 (98)
Space heating per m2												25.4175 (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

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 %)														175.1000	(206)
Efficiency of secondary/supplementary heating system, %														0.0000	(208)
Space heating requirement														885.9119	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Space heating requirement	341.2198	253.7546	188.9885	80.8124	21.3429	0.0000	0.0000	0.0000	0.0000	89.7192	224.4398	350.9544	(98)		
Space heating efficiency (main heating system 1)	175.1000	175.1000	175.1000	175.1000	175.1000	0.0000	0.0000	0.0000	0.0000	175.1000	175.1000	175.1000	(210)		
Space heating fuel (main heating system)	194.8714	144.9198	107.9317	46.1521	12.1890	0.0000	0.0000	0.0000	0.0000	51.2388	128.1781	200.4308	(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	187.3442	165.3882	174.3120	157.1162	154.5896	139.0235	134.3657	146.2711	145.6462	162.8785	171.1497	183.1260	(64)		
Efficiency of water heater (217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)		
Fuel for water heating, kWh/month	106.9927	94.4535	99.5500	89.7294	88.2864	79.3966	76.7365	83.5357	83.1789	93.0203	97.7440	104.5837	(219)		
Water heating fuel used												1097.2078	(219)		
Annual totals kWh/year															
Space heating fuel - main system												885.9119	(211)		
Space heating fuel - secondary												0.0000	(215)		
Electricity for pumps and fans:															
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)															
mechanical ventilation fans (SFP = 0.7500)													150.7746	(230a)	
central heating pump													30.0000	(230c)	
Total electricity for the above, kWh/year													180.7746	(231)	
Electricity for lighting (calculated in Appendix L)													283.1013	(232)	
Energy saving/generation technologies (Appendices M ,N and Q)															
PV Unit 0 (0.80 + 0.68 + 951 + 1.00) =										-517.1351			-517.1351	(233)	
Total delivered energy for all uses													1929.8605	(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	885.9119	0.5190	459.7883 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1097.2078	0.5190	569.4509 (264)
Space and water heating			1029.2391 (265)
Pumps and fans	180.7746	0.5190	93.8220 (267)
Energy for lighting	283.1013	0.5190	146.9296 (268)
Energy saving/generation technologies			
PV Unit	-517.1351	0.5190	-268.3931 (269)
Total CO2, kg/year			1001.5976 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			16.4100 (273)

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

DER			16.4100	ZC1
Total Floor Area		TFA	61.0300	
Assumed number of occupants		N	2.0106	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			17.0440	ZC2
CO2 emissions from cooking, equation (L16)			2.7405	ZC3
Total CO2 emissions			36.1945	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			36.1945	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	61.0300 (1b)	x 2.7000 (2b)	= 164.7810 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 164.7810 (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) = 0.1214 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3714 (18)
Number of sides sheltered					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3435 (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	0.4380	0.4294	0.4208	0.3779	0.3693	0.3263	0.3263	0.3178	0.3435	0.3693	0.3865	0.4036 (22b)
Effective ac	0.5959	0.5922	0.5885	0.5714	0.5682	0.5533	0.5533	0.5505	0.5590	0.5682	0.5747	0.5815 (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			2.0500	1.0000	2.0500			(26)				
TER Semi-glazed door			6.2900	1.2000	7.5480			(26a)				
TER Opening Type (Uw = 1.40)			6.9200	1.3258	9.1742			(27)				
External Wall 1	72.5200	13.2100	59.3100	0.1800	10.6758			(29a)				
Corridor	4.0500	2.0500	2.0000	0.1800	0.3600			(29a)				
External Roof 1	21.8200		21.8200	0.1300	2.8366			(30)				
Total net area of external elements Aum(A, m2)			98.3900					(31)				
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =			32.6446		(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								5.0027 (36)				
Total fabric heat loss						(33) + (36) =		37.6473 (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	32.4046	32.2021	32.0036	31.0711	30.8966	30.0845	30.0845	29.9341	30.3973	30.8966	31.2496	31.6185 (38)
Heat transfer coeff	70.0519	69.8494	69.6509	68.7184	68.5440	67.7318	67.7318	67.5814	68.0447	68.5440	68.8969	69.2659 (39)
Average = Sum(39)m / 12 =												68.7176 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1478	1.1445	1.1413	1.1260	1.1231	1.1098	1.1098	1.1073	1.1149	1.1231	1.1289	1.1349 (40)
HLP (average)												1.1260 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0106 (42)
Average daily hot water use (litres/day)												81.9518 (43)
Daily hot water use	90.1470	86.8689	83.5908	80.3128	77.0347	73.7566	73.7566	77.0347	80.3128	83.5908	86.8689	90.1470 (44)
Energy conte	133.6854	116.9221	120.6531	105.1883	100.9307	87.0955	80.7068	92.6122	93.7183	109.2196	119.2218	129.4671 (45)
Energy content (annual)										Total = Sum(45)m =		1289.4209 (45)
Distribution loss (46)m = 0.15 x (45)m												
20.0528	17.5383	18.0980	15.7782	15.1396	13.0643	12.1060	13.8918	14.0577	16.3829	17.8833	19.4201 (46)	
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (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)												0.8381 (55)
Total storage loss												
	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)
If cylinder contains dedicated solar storage												
	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (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												
	182.9280	161.3993	169.8958	152.8425	150.1733	134.7497	129.9495	141.8549	141.3725	158.4623	166.8760	178.7098 (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	182.9280	161.3993	169.8958	152.8425	150.1733	134.7497	129.9495	141.8549	141.3725	158.4623	166.8760	178.7098 (64)
Heat gains from water heating, kWh/month												
	83.8445	74.4584	79.5113	73.0985	72.9536	67.0826	66.2291	70.1877	69.2847	75.7097	77.7646	82.4420 (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	100.5301	100.5301	100.5301	100.5301	100.5301	100.5301	100.5301	100.5301	100.5301	100.5301	100.5301	100.5301	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.5885	15.6220	12.7046	9.6182	7.1897	6.0699	6.5587	8.5253	11.4426	14.5290	16.9575	18.0774	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.5369	177.3585	172.7683	162.9963	150.6610	139.0675	131.3224	129.5008	134.0910	143.8630	156.1983	167.7918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0530	33.0530	33.0530	33.0530	33.0530	33.0530	33.0530	33.0530	33.0530	33.0530	33.0530	33.0530	(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)	-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	(71)
Water heating gains (Table 5)	112.6942	110.8012	106.8700	101.5256	98.0559	93.1703	89.0177	94.3383	96.2287	101.7603	108.0064	110.8091	(72)
Total internal gains	361.9788	359.9407	348.5020	330.2992	312.0657	294.4667	283.0578	288.5235	297.9214	316.3113	337.3212	352.8373	(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				1.7300	10.6334	0.6300	0.7000	0.7700	5.6220 (74)			
East				3.8900	19.6403	0.6300	0.7000	0.7700	23.3490 (76)			
South				1.3000	46.7521	0.6300	0.7000	0.7700	18.5745 (78)			

Solar gains	47.5455	86.8397	132.2277	182.8262	219.5894	223.8414	213.4264	185.5524	149.9146	99.7982	58.0660	39.9379 (83)
Total gains	409.5242	446.7804	480.7297	513.1254	531.6551	518.3081	496.4841	474.0758	447.8360	416.1095	395.3872	392.7752 (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	60.5007	60.6762	60.8491	61.6748	61.8318	62.5732	62.5732	62.7124	62.2855	61.8318	61.5150	61.1873
alpha	5.0334	5.0451	5.0566	5.1117	5.1221	5.1715	5.1715	5.1808	5.1524	5.1221	5.1010	5.0792
util living area	0.9967	0.9943	0.9876	0.9657	0.9023	0.7550	0.5824	0.6284	0.8566	0.9726	0.9935	0.9973 (86)
MIT	19.8274	19.9520	20.1751	20.4808	20.7561	20.9347	20.9862	20.9799	20.8670	20.5235	20.1274	19.8088 (87)
Th 2	19.9620	19.9646	19.9673	19.9797	19.9820	19.9928	19.9928	19.9948	19.9887	19.9820	19.9773	19.9724 (88)
util rest of house	0.9956	0.9923	0.9831	0.9523	0.8628	0.6662	0.4582	0.5045	0.7876	0.9592	0.9910	0.9964 (89)
MIT 2	18.4075	18.5909	18.9167	19.3623	19.7352	19.9475	19.9876	19.9863	19.8798	19.4295	18.8564	18.3878 (90)
Living area fraction	18.8819	19.0456	19.3371	19.7360	20.0763	20.2773	20.3212	20.3182	20.2096	19.7950	19.2811	18.8626 (91)
MIT	18.8819	19.0456	19.3371	19.7360	20.0763	20.2773	20.3212	20.3182	20.2096	19.7950	19.2811	18.8626 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8819	19.0456	19.3371	19.7360	20.0763	20.2773	20.3212	20.3182	20.2096	19.7950	19.2811	18.8626 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9940	0.9899	0.9795	0.9484	0.8670	0.6933	0.5000	0.5462	0.8048	0.9560	0.9885	0.9951	(94)
Useful gains	407.0496	442.2790	470.8580	486.6242	460.9713	359.3513	248.2624	258.9190	360.4118	397.8100	390.8429	390.8363	(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	1021.4877	988.0629	894.1163	744.6327	574.1430	384.5356	252.0448	264.7998	415.7267	630.2594	839.2385	1015.6172	(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	457.1419	366.7668	314.9042	185.7661	84.1997	0.0000	0.0000	0.0000	0.0000	172.9423	322.8448	464.8370	(98)
Space heating												2369.4030	(98)
Space heating per m2												38.8236	(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												2534.1208 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	457.1419	366.7668	314.9042	185.7661	84.1997	0.0000	0.0000	0.0000	0.0000	172.9423	322.8448	464.8370 (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)	488.9218	392.2639	336.7960	198.6804	90.0532	0.0000	0.0000	0.0000	0.0000	184.9651	345.2886	497.1519 (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	182.9280	161.3993	169.8958	152.8425	150.1733	134.7497	129.9495	141.8549	141.3725	158.4623	166.8760	178.7098 (64)
Efficiency of water heater (217)m	87.1600	86.9378	86.4383	85.3352	83.3399	79.8000	79.8000	79.8000	79.8000	85.0473	86.5457	79.8000 (216)
Fuel for water heating, kWh/month	209.8762	185.6492	196.5515	179.1084	180.1938	168.8593	162.8439	177.7630	177.1585	186.3225	192.8184	204.8221 (219)
Water heating fuel used												2221.9669 (219)
Annual totals kWh/year												
Space heating fuel - main system												2534.1208 (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)												310.6190 (232)
Total delivered energy for all uses												5141.7067 (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	2534.1208	0.2160	547.3701 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2221.9669	0.2160	479.9448 (264)
Space and water heating			1027.3149 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	310.6190	0.5190	161.2113 (268)
Total CO2, kg/m2/year			1227.4512 (272)
Emissions per m2 for space and water heating			16.8330 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.6415 (272b)
Emissions per m2 for pumps and fans			0.6378 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.8330 * 1.55) + 2.6415 + 0.6378, rounded to 2 d.p.			29.3700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 12			Issued on Date	13/04/2022
Assessment Reference	Unit 12_Be Lean	Prop Type Ref	160 Malden Road		
Property	160, Malden Road				
SAP Rating	84 B	DER	17.52	TER	20.11
Environmental	88 B	% DER<TER	12.89		
CO ₂ Emissions (t/year)	0.90	DFEE	46.85	TFEE	53.85
General Requirements Compliance	Pass	% DFEE<TFEE	13.00		
Assessor Details	Mr. Andy Love, Love Design Studio Ltd, Tel: 07563755762, Mail@lovedesignstudio.co.uk			Assessor ID	U860-0001
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 61 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
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 20.11 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.52 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)53.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)46.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.22 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.100

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
x x

Efficiency: 90%
Minimum: 88% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage Nominal cylinder loss: 1.82 kWh/day
Permitted by DBSCG 2.10 OK
Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK
Independent timer for DHW OK

Boiler interlock Yes OK

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: 0.60
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: 2.70 m², No overhang
Windows facing East: 6.07 m², No overhang
Windows facing South: 2.02 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Roof U-value 0.12 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	61.0300 (1b)	x 2.7000 (2b)	= 164.7810 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 164.7810 (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					1 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (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	0.2987	0.2952	0.2917	0.2744	0.2709	0.2536	0.2536	0.2501	0.2605	0.2709	0.2778	0.2848 (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
windows (Uw = 1.20)			10.7900	1.1450	12.3550		(27)
Half glazed doors			6.2900	1.2000	7.5480		(26a)
Solid Door			2.0500	1.4000	2.8700		(26)
External Wall 1	72.5200	17.0800	55.4400	0.1400	7.7616		(29a)
Corridor	4.0500	2.0500	2.0000	0.1342	0.2684		(29a)
External Roof 1	21.8200		21.8200	0.1200	2.6184		(30)
Total net area of external elements Aum(A, m ²)			98.3900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	33.4213			(33)
Party Wall 1			28.0700	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K	250.0000 (35)
Thermal bridges (User defined value 0.100 * total exposed area)	9.8390 (36)
Total fabric heat loss	(33) + (36) = 43.2603 (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	16.2402	16.0516	15.8630	14.9199	14.7313	13.7882	13.7882	13.5995	14.1654	14.7313	15.1085	15.4858 (38)
Heat transfer coeff	59.5006	59.3119	59.1233	58.1802	57.9916	57.0485	57.0485	56.8598	57.4257	57.9916	58.3688	58.7461 (39)
Average = Sum(39)m / 12 =												58.1330 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.9749	0.9718	0.9688	0.9533	0.9502	0.9348	0.9348	0.9317	0.9409	0.9502	0.9564	0.9626 (40)
HLP (average)												0.9525 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0106 (42)
Average daily hot water use (litres/day)												81.9518 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	90.1470	86.8689	83.5908	80.3128	77.0347	73.7566	73.7566	77.0347	80.3128	83.5908	86.8689	90.1470 (44)
Energy conte	133.6854	116.9221	120.6531	105.1883	100.9307	87.0955	80.7068	92.6122	93.7183	109.2196	119.2218	129.4671 (45)
Energy content (annual)												Total = Sum(45)m = 1289.4209 (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

	20.0528	17.5383	18.0980	15.7782	15.1396	13.0643	12.1060	13.8918	14.0577	16.3829	17.8833	19.4201 (46)
Water storage loss:												
Store volume												180.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0115 (51)
Volume factor from Table 2a												0.8736 (52)
Temperature factor from Table 2b												0.5400 (53)
Enter (49) or (54) in (55)												0.9805 (55)
Total storage loss												
30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965	(56)
If cylinder contains dedicated solar storage												
30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965	(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												
187.3442	165.3882	174.3120	157.1162	154.5896	139.0235	134.3657	146.2711	145.6462	162.8785	171.1497	183.1260	(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												
187.3442	165.3882	174.3120	157.1162	154.5896	139.0235	134.3657	146.2711	145.6462	162.8785	171.1497	183.1260	(64)
Heat gains from water heating, kWh/month												
87.3775	77.6495	83.0443	76.5175	76.4866	70.5016	69.7621	73.7207	72.7037	79.2426	81.1836	85.9749	(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	
100.5301	100.5301	100.5301	100.5301	100.5301	100.5301	100.5301	100.5301	100.5301	100.5301	100.5301	100.5301	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
16.0304	14.2380	11.5791	8.7662	6.5528	5.3322	5.9777	7.7700	10.4289	13.2419	15.4552	16.4759	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
175.5369	177.3585	172.7683	162.9963	150.6610	139.0675	131.3224	129.5008	134.0910	143.8630	156.1983	167.7918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
33.0530	33.0530	33.0530	33.0530	33.0530	33.0530	33.0530	33.0530	33.0530	33.0530	33.0530	33.0530	(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	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	(71)
Water heating gains (Table 5)												
117.4429	115.5498	111.6186	106.2743	102.8045	97.9189	93.7663	99.0869	100.9774	106.5089	112.7550	115.5577	(72)
Total internal gains												
365.1692	363.3053	352.1251	334.1958	316.1773	298.6776	287.2254	292.5168	301.6563	319.7728	340.5676	355.9844	(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	
North		2.7000	10.6334	0.6300	0.7000	0.7700	8.7742 (74)
East		6.0700	19.6403	0.6300	0.7000	0.7700	36.4341 (76)
South		2.0200	46.7521	0.6300	0.7000	0.7700	28.8618 (78)

Solar gains	74.0701	135.3090	206.0803	285.0048	342.3614	349.0082	332.7623	289.2732	233.6688	155.5145	90.4642	62.2155 (83)
Total gains	439.2393	498.6143	558.2054	619.2006	658.5387	647.6858	619.9877	581.7900	535.3251	475.2873	431.0318	418.1999 (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	71.2295	71.4560	71.6840	72.8460	73.0829	74.2911	74.2911	74.5376	73.8031	73.0829	72.6106	72.1443
alpha	5.7486	5.7637	5.7789	5.8564	5.8722	5.9527	5.9527	5.9692	5.9202	5.8722	5.8407	5.8096
util living area												
	0.9949	0.9886	0.9691	0.9029	0.7575	0.5555	0.4038	0.4475	0.7032	0.9350	0.9882	0.9961 (86)
MIT	20.1151	20.2652	20.4966	20.7688	20.9354	20.9914	20.9989	20.9980	20.9683	20.7465	20.3853	20.0912 (87)
Th 2	20.1043	20.1069	20.1094	20.1224	20.1250	20.1381	20.1381	20.1407	20.1328	20.1250	20.1198	20.1146 (88)
util rest of house												
	0.9933	0.9850	0.9596	0.8758	0.7038	0.4843	0.3253	0.3650	0.6289	0.9104	0.9839	0.9948 (89)
MIT 2	18.9307	19.1499	19.4825	19.8638	20.0664	20.1327	20.1377	20.1399	20.1099	19.8451	19.3352	18.9038 (90)
Living area fraction												
	19.3264	19.5225	19.8213	20.1662	20.3567	20.4196	20.4254	20.4266	20.3967	20.1463	19.6860	19.3005 (91)
MIT												
Temperature adjustment												-0.1500
adjusted MIT	19.1764	19.3725	19.6713	20.0162	20.2067	20.2696	20.2754	20.2766	20.2467	19.9963	19.5360	19.1505 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9909	0.9812	0.9538	0.8721	0.7092	0.4953	0.3378	0.3782	0.6392	0.9060	0.9801	0.9929 (94)
Useful gains	435.2640	489.2499	532.4253	539.9831	467.0097	320.8270	209.4569	220.0047	342.1577	430.6138	422.4488	415.2405 (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												
	885.1558	858.3947	778.7311	646.7403	493.3175	323.4430	209.6755	220.4224	352.9792	544.9036	725.8751	878.2842 (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												
	334.7195	248.0653	183.2515	76.8652	19.5730	0.0000	0.0000	0.0000	0.0000	85.0317	218.4670	344.5045 (98)
Space heating												1510.4777 (98)
Space heating per m2											(98) / (4) =	24.7498 (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

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 %)																	89.5000 (206)
Efficiency of secondary/supplementary heating system, %																	0.0000 (208)
Space heating requirement																	1687.6846 (211)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
334.7195	248.0653	183.2515	76.8652	19.5730	0.0000	0.0000	0.0000	0.0000	0.0000	85.0317	218.4670	344.5045	(98)				
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)				
Space heating fuel (main heating system)	373.9883	277.1680	204.7503	85.8829	21.8693	0.0000	0.0000	0.0000	0.0000	95.0074	244.0972	384.9213	(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	187.3442	165.3882	174.3120	157.1162	154.5896	139.0235	134.3657	146.2711	145.6462	162.8785	171.1497	183.1260	(64)				
Efficiency of water heater (217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(216)				
Fuel for water heating, kWh/month	209.3232	184.7912	194.7620	175.5489	172.7258	155.3335	150.1292	163.4314	162.7332	181.9872	191.2287	204.6101	(219)				
Water heating fuel used												2146.6044	(219)				
Annual totals kWh/year																	
Space heating fuel - main system												1687.6846	(211)				
Space heating fuel - secondary												0.0000	(215)				
Electricity for pumps and fans:																	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)																	
mechanical ventilation fans (SFP = 0.7500)													150.7746	(230a)			
central heating pump													30.0000	(230c)			
Total electricity for the above, kWh/year													180.7746	(231)			
Electricity for lighting (calculated in Appendix L)													283.1013	(232)			
Total delivered energy for all uses													4298.1649	(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	1687.6846	0.2160	364.5399 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2146.6044	0.2160	463.6665 (264)
Space and water heating			828.2064 (265)
Pumps and fans	180.7746	0.5190	93.8220 (267)
Energy for lighting	283.1013	0.5190	146.9296 (268)
Total CO2, kg/year			1068.9580 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			17.5200 (273)

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

DER			17.5200 ZC1
Total Floor Area		TFA	61.0300
Assumed number of occupants		N	2.0106
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			17.0440 ZC2
CO2 emissions from cooking, equation (L16)			2.7405 ZC3
Total CO2 emissions			37.3045 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			37.3045 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	61.0300 (1b)	x 2.7000 (2b)	= 164.7810 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.0300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 164.7810 (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) = 0.1214 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3714 (18)
Number of sides sheltered					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3435 (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	0.4380	0.4294	0.4208	0.3779	0.3693	0.3263	0.3263	0.3178	0.3435	0.3693	0.3865	0.4036 (22b)
Effective ac	0.5959	0.5922	0.5885	0.5714	0.5682	0.5533	0.5533	0.5505	0.5590	0.5682	0.5747	0.5815 (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			2.0500	1.0000	2.0500			(26)				
TER Semi-glazed door			6.2900	1.2000	7.5480			(26a)				
TER Opening Type (Uw = 1.40)			6.9200	1.3258	9.1742			(27)				
External Wall 1	72.5200	13.2100	59.3100	0.1800	10.6758			(29a)				
Corridor	4.0500	2.0500	2.0000	0.1800	0.3600			(29a)				
External Roof 1	21.8200		21.8200	0.1300	2.8366			(30)				
Total net area of external elements Aum(A, m2)			98.3900					(31)				
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =			32.6446		(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								5.0027 (36)				
Total fabric heat loss						(33) + (36) =		37.6473 (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	32.4046	32.2021	32.0036	31.0711	30.8966	30.0845	30.0845	29.9341	30.3973	30.8966	31.2496	31.6185 (38)
Heat transfer coeff	70.0519	69.8494	69.6509	68.7184	68.5440	67.7318	67.7318	67.5814	68.0447	68.5440	68.8969	69.2659 (39)
Average = Sum(39)m / 12 =												68.7176 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1478	1.1445	1.1413	1.1260	1.1231	1.1098	1.1098	1.1073	1.1149	1.1231	1.1289	1.1349 (40)
HLP (average)												1.1260 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0106 (42)
Average daily hot water use (litres/day)												81.9518 (43)
Daily hot water use	90.1470	86.8689	83.5908	80.3128	77.0347	73.7566	73.7566	77.0347	80.3128	83.5908	86.8689	90.1470 (44)
Energy conte	133.6854	116.9221	120.6531	105.1883	100.9307	87.0955	80.7068	92.6122	93.7183	109.2196	119.2218	129.4671 (45)
Energy content (annual)										Total = Sum(45)m =		1289.4209 (45)
Distribution loss (46)m = 0.15 x (45)m												
	20.0528	17.5383	18.0980	15.7782	15.1396	13.0643	12.1060	13.8918	14.0577	16.3829	17.8833	19.4201 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (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)												0.8381 (55)
Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (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	182.9280	161.3993	169.8958	152.8425	150.1733	134.7497	129.9495	141.8549	141.3725	158.4623	166.8760	178.7098 (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	182.9280	161.3993	169.8958	152.8425	150.1733	134.7497	129.9495	141.8549	141.3725	158.4623	166.8760	178.7098 (64)
Heat gains from water heating, kWh/month	83.8445	74.4584	79.5113	73.0985	72.9536	67.0826	66.2291	70.1877	69.2847	75.7097	77.7646	82.4420 (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	100.5301	100.5301	100.5301	100.5301	100.5301	100.5301	100.5301	100.5301	100.5301	100.5301	100.5301	100.5301	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.5885	15.6220	12.7046	9.6182	7.1897	6.0699	6.5587	8.5253	11.4426	14.5290	16.9575	18.0774	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	175.5369	177.3585	172.7683	162.9963	150.6610	139.0675	131.3224	129.5008	134.0910	143.8630	156.1983	167.7918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.0530	33.0530	33.0530	33.0530	33.0530	33.0530	33.0530	33.0530	33.0530	33.0530	33.0530	33.0530	(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)	-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	-80.4241	(71)
Water heating gains (Table 5)	112.6942	110.8012	106.8700	101.5256	98.0559	93.1703	89.0177	94.3383	96.2287	101.7603	108.0064	110.8091	(72)
Total internal gains	361.9788	359.9407	348.5020	330.2992	312.0657	294.4667	283.0578	288.5235	297.9214	316.3113	337.3212	352.8373	(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				1.7300	10.6334	0.6300	0.7000	0.7700	5.6220 (74)			
East				3.8900	19.6403	0.6300	0.7000	0.7700	23.3490 (76)			
South				1.3000	46.7521	0.6300	0.7000	0.7700	18.5745 (78)			
Solar gains	47.5455	86.8397	132.2277	182.8262	219.5894	223.8414	213.4264	185.5524	149.9146	99.7982	58.0660	39.9379 (83)
Total gains	409.5242	446.7804	480.7297	513.1254	531.6551	518.3081	496.4841	474.0758	447.8360	416.1095	395.3872	392.7752 (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	60.5007	60.6762	60.8491	61.6748	61.8318	62.5732	62.5732	62.7124	62.2855	61.8318	61.5150	61.1873
alpha	5.0334	5.0451	5.0566	5.1117	5.1221	5.1715	5.1715	5.1808	5.1524	5.1221	5.1010	5.0792
util living area	0.9967	0.9943	0.9876	0.9657	0.9023	0.7550	0.5824	0.6284	0.8566	0.9726	0.9935	0.9973 (86)
MIT	19.8274	19.9520	20.1751	20.4808	20.7561	20.9347	20.9862	20.9799	20.8670	20.5235	20.1274	19.8088 (87)
Th 2	19.9620	19.9646	19.9673	19.9797	19.9820	19.9928	19.9928	19.9948	19.9887	19.9820	19.9773	19.9724 (88)
util rest of house	0.9956	0.9923	0.9831	0.9523	0.8628	0.6662	0.4582	0.5045	0.7876	0.9592	0.9910	0.9964 (89)
MIT 2	18.4075	18.5909	18.9167	19.3623	19.7352	19.9475	19.9876	19.9863	19.8798	19.4295	18.8564	18.3878 (90)
Living area fraction										fLA = Living area / (4) =		0.3341 (91)
MIT	18.8819	19.0456	19.3371	19.7360	20.0763	20.2773	20.3212	20.3182	20.2096	19.7950	19.2811	18.8626 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8819	19.0456	19.3371	19.7360	20.0763	20.2773	20.3212	20.3182	20.2096	19.7950	19.2811	18.8626 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	407.0496	442.2790	470.8580	486.6242	460.9713	359.3513	248.2624	258.9190	360.4118	397.8100	390.8429	390.8363	(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	1021.4877	988.0629	894.1163	744.6327	574.1430	384.5356	252.0448	264.7998	415.7267	630.2594	839.2385	1015.6172	(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	457.1419	366.7668	314.9042	185.7661	84.1997	0.0000	0.0000	0.0000	0.0000	172.9423	322.8448	464.8370	(98)
Space heating												2369.4030	(98)
Space heating per m2												38.8236	(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												2534.1208 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	457.1419	366.7668	314.9042	185.7661	84.1997	0.0000	0.0000	0.0000	0.0000	172.9423	322.8448	464.8370 (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)	488.9218	392.2639	336.7960	198.6804	90.0532	0.0000	0.0000	0.0000	0.0000	184.9651	345.2886	497.1519 (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	182.9280	161.3993	169.8958	152.8425	150.1733	134.7497	129.9495	141.8549	141.3725	158.4623	166.8760	178.7098 (64)
Efficiency of water heater (217)m	87.1600	86.9378	86.4383	85.3352	83.3399	79.8000	79.8000	79.8000	79.8000	85.0473	86.5457	79.8000 (216)
Fuel for water heating, kWh/month	209.8762	185.6492	196.5515	179.1084	180.1938	168.8593	162.8439	177.7630	177.1585	186.3225	192.8184	204.8221 (219)
Water heating fuel used												2221.9669 (219)
Annual totals kWh/year												
Space heating fuel - main system												2534.1208 (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)												310.6190 (232)
Total delivered energy for all uses												5141.7067 (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	2534.1208	0.2160	547.3701 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2221.9669	0.2160	479.9448 (264)
Space and water heating			1027.3149 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	310.6190	0.5190	161.2113 (268)
Total CO2, kg/m2/year			1227.4512 (272)
Emissions per m2 for space and water heating			16.8330 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.6415 (272b)
Emissions per m2 for pumps and fans			0.6378 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.8330 * 1.00) + 2.6415 + 0.6378, rounded to 2 d.p.			20.1100 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 13				Issued on Date	13/04/2022
Assessment Reference	Unit 13_Be Green	Prop Type Ref	160 Malden Road			
Property	160, Malden Road					
SAP Rating	85 B	DER	19.09	TER	31.44	
Environmental	87 B	% DER<TER	39.28			
CO ₂ Emissions (t/year)	0.98	DFEE	56.52	TFEE	62.85	
General Requirements Compliance	Pass	% DFEE<TFEE	10.08			
Assessor Details	Mr. Andy Love, Love Design Studio Ltd, Tel: 07563755762, Mail@lovedesignstudio.co.uk				Assessor ID	U860-0001
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 67 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
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 31.44 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 19.09 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 62.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 56.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.22 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.100

3 Air permeability

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

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric
Air-to-water heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water storage Nominal cylinder loss: 1.82 kWh/day
Permitted by DBSCG 2.10 OK
Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

Cylinderstat OK
Independent timer for DHW OK

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: 0.60
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: 11.88 m², No overhang
Windows facing South: 2.02 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Roof U-value 0.12 W/m²K
Air permeability 3.0 m³/m²h
Photovoltaic array 0.68 kW

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	66.5100 (1b)	x 2.7000 (2b)	= 179.5770 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.5100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 179.5770 (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							1	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.9250 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1388 (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)
	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (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	0.2987	0.2952	0.2917	0.2744	0.2709	0.2536	0.2536	0.2501	0.2605	0.2709	0.2778	0.2848 (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					
windows (Uw = 1.20)			13.9000	1.1450	15.9160		(27)					
Half glazed doors			6.2900	1.2000	7.5480		(26a)					
Solid Door			2.0500	1.4000	2.8700		(26)					
External Wall 1	70.3200	20.1900	50.1300	0.1400	7.0182		(29a)					
Corridor	4.0500	2.0500	2.0000	0.1342	0.2684		(29a)					
External Roof 1	66.5100		66.5100	0.1200	7.9812		(30)					
Total net area of external elements Aum(A, m2)			140.8800				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		41.6018		(33)					
Party Wall 1			19.6200	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (User defined value 0.100 * total exposed area)								14.0880 (36)				
Total fabric heat loss						(33) + (36) =	55.6898 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 17.6985	Feb 17.4929	Mar 17.2874	Apr 16.2596	May 16.0540	Jun 15.0262	Jul 15.0262	Aug 14.8207	Sep 15.4373	Oct 16.0540	Nov 16.4651	Dec 16.8763 (38)
Heat transfer coeff	73.3883	73.1827	72.9772	71.9494	71.7438	70.7160	70.7160	70.5104	71.1271	71.7438	72.1549	72.5660 (39)
Average = Sum(39)m / 12 =												71.8980 (39)
HLP	Jan 1.1034	Feb 1.1003	Mar 1.0972	Apr 1.0818	May 1.0787	Jun 1.0632	Jul 1.0632	Aug 1.0601	Sep 1.0694	Oct 1.0787	Nov 1.0849	Dec 1.0911 (40)
HLP (average)												1.0810 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1585 (42)
Average daily hot water use (litres/day)												85.4646 (43)
Daily hot water use	Jan 94.0111	Feb 90.5925	Mar 87.1739	Apr 83.7553	May 80.3367	Jun 76.9182	Jul 76.9182	Aug 80.3367	Sep 83.7553	Oct 87.1739	Nov 90.5925	Dec 94.0111 (44)
Energy conte	139.4157	121.9339	125.8248	109.6971	105.2570	90.8288	84.1662	96.5820	97.7355	113.9013	124.3322	135.0167 (45)
Energy content (annual)												Total = Sum(45)m = 1344.6912 (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

20.9124	18.2901	18.8737	16.4546	15.7886	13.6243	12.6249	14.4873	14.6603	17.0852	18.6498	20.2525 (46)
Water storage loss:											
Store volume											180.0000 (47)
b) If manufacturer declared loss factor is not known :											
Hot water storage loss factor from Table 2 (kWh/litre/day)											0.0115 (51)
Volume factor from Table 2a											0.8736 (52)
Temperature factor from Table 2b											0.5400 (53)
Enter (49) or (54) in (55)											0.9805 (55)
Total storage loss											
30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (56)
If cylinder contains dedicated solar storage											
30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (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											
193.0746	170.4000	179.4837	161.6251	158.9159	142.7568	137.8251	150.2409	149.6634	167.5602	176.2601	188.6756 (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											
193.0746	170.4000	179.4837	161.6251	158.9159	142.7568	137.8251	150.2409	149.6634	167.5602	176.2601	188.6756 (64)
Total per year (kWh/year) = Sum(64)m =											1976.4813 (64)
Heat gains from water heating, kWh/month											
89.2828	79.3159	84.7639	78.0167	77.9251	71.7429	70.9124	75.0406	74.0394	80.7993	82.8828	87.8202 (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	107.9255	107.9255	107.9255	107.9255	107.9255	107.9255	107.9255	107.9255	107.9255	107.9255	107.9255 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5											
16.9032	15.0133	12.2096	9.2435	6.9096	5.8334	6.3032	8.1931	10.9968	13.9629	16.2968	17.3730 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											
189.0186	190.9801	186.0373	175.5149	162.2322	149.7483	141.4083	139.4468	144.3896	154.9120	168.1947	180.6786 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
33.7926	33.7926	33.7926	33.7926	33.7926	33.7926	33.7926	33.7926	33.7926	33.7926	33.7926	33.7926 (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)											
-86.3404	-86.3404	-86.3404	-86.3404	-86.3404	-86.3404	-86.3404	-86.3404	-86.3404	-86.3404	-86.3404	-86.3404 (71)
Water heating gains (Table 5)											
120.0038	118.0296	113.9299	108.3565	104.7380	99.6430	95.3123	100.8610	102.8325	108.6012	115.1150	118.0378 (72)
Total internal gains											
384.3033	382.4006	370.5546	351.4925	332.2574	313.6023	301.4014	306.8786	316.5965	335.8538	357.9842	374.4671 (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				11.8800	10.6334		0.6300		0.7000		0.7700		38.6065 (74)	
South				2.0200	46.7521		0.6300		0.7000		0.7700		28.8618 (78)	
Solar gains	67.4683	121.0472	185.5798	269.4258	342.1834	358.6469	337.8069	279.8601	213.6314	138.8074	81.8372	57.1235	(83)	
Total gains	451.7716	503.4478	556.1344	620.9183	674.4408	672.2492	639.2083	586.7387	530.2279	474.6612	439.8214	431.5907	(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	62.9358	63.1126	63.2904	64.1945	64.3784	65.3141	65.3141	65.5045	64.9366	64.3784	64.0116
alpha	5.1957	5.2075	5.2194	5.2796	5.2919	5.3543	5.3543	5.3670	5.3291	5.2919	5.2674
util living area											
0.9965	0.9931	0.9832	0.9453	0.8365	0.6445	0.4814	0.5423	0.8077	0.9647	0.9927	0.9972 (86)
MIT											
19.8957	20.0335	20.2709	20.5945	20.8526	20.9722	20.9951	20.9911	20.9104	20.5877	20.1907	19.8742 (87)
Th 2											
19.9980	20.0006	20.0031	20.0157	20.0183	20.0310	20.0310	20.0335	20.0259	20.0183	20.0132	20.0081 (88)
util rest of house											
0.9953	0.9909	0.9774	0.9262	0.7855	0.5587	0.3783	0.4338	0.7323	0.9485	0.9898	0.9963 (89)
MIT 2											
18.5329	18.7353	19.0803	19.5452	19.8779	20.0132	20.0292	20.0299	19.9562	19.5458	18.9742	18.5089 (90)
Living area fraction											
fLA = Living area / (4) =											
19.1011	19.2766	19.5767	19.9827	20.2843	20.4131	20.4319	20.4307	20.3540	19.9802	19.4814	19.0781 (92)
Temperature adjustment											
adjusted MIT	19.1011	19.2766	19.5767	19.9827	20.2843	20.4131	20.4319	20.4307	20.3540	19.9802	19.4814
											0.0000
											19.0781 (93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9939	0.9887	0.9742	0.9254	0.8005	0.5936	0.4792	0.7599	0.9477	0.9877	0.9951 (94)
Useful gains	448.9937	497.7366	541.7805	574.6071	539.9122	399.0777	269.3935	281.1813	402.9459	449.8523	434.4148
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W											
1086.2274	1052.1154	954.3015	797.3900	615.8676	411.0757	270.9773	284.2062	444.8316	672.9702	893.3772	1079.6455 (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											
474.1019	372.5425	306.9156	160.4037	56.5109	0.0000	0.0000	0.0000	0.0000	165.9997	330.4529	483.7322 (98)
Space heating											
Space heating per m2											2350.6594 (98)
											(98) / (4) =
											35.3429 (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

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 %)													175.1000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1342.4668 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	474.1019	372.5425	306.9156	160.4037	56.5109	0.0000	0.0000	0.0000	0.0000	165.9997	330.4529	483.7322	(98)
Space heating efficiency (main heating system 1)	175.1000	175.1000	175.1000	175.1000	175.1000	0.0000	0.0000	0.0000	0.0000	175.1000	175.1000	175.1000	(210)
Space heating fuel (main heating system)	270.7606	212.7599	175.2802	91.6069	32.2735	0.0000	0.0000	0.0000	0.0000	94.8028	188.7224	276.2605	(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	193.0746	170.4000	179.4837	161.6251	158.9159	142.7568	137.8251	150.2409	149.6634	167.5602	176.2601	188.6756	(64)
Efficiency of water heater	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)
Fuel for water heating, kWh/month	110.2653	97.3158	102.5036	92.3045	90.7572	81.5287	78.7122	85.8029	85.4731	95.6940	100.6625	107.7530	(219)
Water heating fuel used												1128.7729	(219)
Annual totals kWh/year													
Space heating fuel - main system												1342.4668	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)													164.3130 (230a)
central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													194.3130 (231)
Electricity for lighting (calculated in Appendix L)													298.5163 (232)
Energy saving/generation technologies (Appendices M, N and Q)													
PV Unit 0 (0.80 * 0.68 * 951 * 1.00) =										-517.1351			-517.1351 (233)
Total delivered energy for all uses													2446.9338 (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	1342.4668	0.5190	696.7403	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1128.7729	0.5190	585.8331	(264)
Space and water heating			1282.5734	(265)
Pumps and fans	194.3130	0.5190	100.8484	(267)
Energy for lighting	298.5163	0.5190	154.9299	(268)
Energy saving/generation technologies				
PV Unit	-517.1351	0.5190	-268.3931	(269)
Total CO2, kg/year			1269.9586	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			19.0900	(273)

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

DER		19.0900	ZC1
Total Floor Area		66.5100	
Assumed number of occupants		2.1585	
CO2 emission factor in Table 12 for electricity displaced from grid		0.5190	
CO2 emissions from appliances, equation (L14)		16.8408	ZC2
CO2 emissions from cooking, equation (L16)		2.5681	ZC3
Total CO2 emissions		38.4989	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		38.4989	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	66.5100 (1b)	x 2.7000 (2b)	= 179.5770 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.5100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 179.5770 (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) = 0.1114 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3614 (18)
Number of sides sheltered					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3343 (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	0.4262	0.4178	0.4095	0.3677	0.3593	0.3176	0.3176	0.3092	0.3343	0.3593	0.3761	0.3928 (22b)
Effective ac	0.5908	0.5873	0.5838	0.5676	0.5646	0.5504	0.5504	0.5478	0.5559	0.5646	0.5707	0.5771 (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			2.0500	1.0000	2.0500		(26)					
TER Semi-glazed door			6.2900	1.2000	7.5480		(26a)					
TER Opening Type (Uw = 1.40)			8.2800	1.3258	10.9773		(27)					
External Wall 1	70.3200	14.5700	55.7500	0.1800	10.0350		(29a)					
Corridor	4.0500	2.0500	2.0000	0.1800	0.3600		(29a)					
External Roof 1	66.5100		66.5100	0.1300	8.6463		(30)					
Total net area of external elements Aum(A, m2)			140.8800				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.6166		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.7215 (36)					
Total fabric heat loss						(33) + (36) =	47.3381 (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	35.0123	34.8033	34.5984	33.6362	33.4562	32.6182	32.6182	32.4630	32.9410	33.4562	33.8204	34.2011 (38)
Heat transfer coeff	82.3503	82.1414	81.9365	80.9743	80.7943	79.9562	79.9562	79.8011	80.2790	80.7943	81.1585	81.5392 (39)
Average = Sum(39)m / 12 =												80.9734 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2382	1.2350	1.2319	1.2175	1.2148	1.2022	1.2022	1.1998	1.2070	1.2148	1.2202	1.2260 (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												2.1585 (42)
Average daily hot water use (litres/day)												85.4646 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	94.0111	90.5925	87.1739	83.7553	80.3367	76.9182	76.9182	80.3367	83.7553	87.1739	90.5925	94.0111 (44)
Energy conte	139.4157	121.9339	125.8248	109.6971	105.2570	90.8288	84.1662	96.5820	97.7355	113.9013	124.3322	135.0167 (45)
Energy content (annual)											Total = Sum(45)m =	1344.6912 (45)
Distribution loss	(46)m = 0.15 x (45)m											
	20.9124	18.2901	18.8737	16.4546	15.7886	13.6243	12.6249	14.4873	14.6603	17.0852	18.6498	20.2525 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (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)													0.8381 (55)
Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(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	188.6584	166.4111	175.0675	157.3513	154.4997	138.4830	133.4089	145.8247	145.3897	163.1440	171.9864	184.2593	(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	188.6584	166.4111	175.0675	157.3513	154.4997	138.4830	133.4089	145.8247	145.3897	163.1440	171.9864	184.2593	(64)
Heat gains from water heating, kWh/month	85.7499	76.1248	81.2309	74.5977	74.3921	68.3239	67.3794	71.5076	70.6204	77.2663	79.4638	84.2872	(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	107.9255	107.9255	107.9255	107.9255	107.9255	107.9255	107.9255	107.9255	107.9255	107.9255	107.9255	107.9255	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5524	16.4781	13.4009	10.1453	7.5837	6.4025	6.9181	8.9925	12.0697	15.3252	17.8868	19.0680	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	189.0186	190.9801	186.0373	175.5149	162.2322	149.7483	141.4083	139.4468	144.3896	154.9120	168.1947	180.6786	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.7926	33.7926	33.7926	33.7926	33.7926	33.7926	33.7926	33.7926	33.7926	33.7926	33.7926	33.7926	(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)	-86.3404	-86.3404	-86.3404	-86.3404	-86.3404	-86.3404	-86.3404	-86.3404	-86.3404	-86.3404	-86.3404	-86.3404	(71)
Water heating gains (Table 5)	115.2552	113.2810	109.1813	103.6079	99.9894	94.8944	90.5637	96.1124	98.0839	103.8526	110.3664	113.2892	(72)
Total internal gains	381.2039	379.1168	366.9972	347.6457	328.1829	309.4228	297.2678	302.9294	312.9208	332.4675	354.8256	371.4135	(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					7.0800	10.6334	0.6300	0.7000			0.7700	23.0079
South					1.2000	46.7521	0.6300	0.7000			0.7700	(74) 17.1456
Solar gains	40.1535	72.0494	110.4837	160.4376	203.7927	213.6094	201.1925	166.6622	127.1962	82.6267	48.7066	33.9959 (83)
Total gains	421.3574	451.1662	477.4808	508.0833	531.9756	523.0322	498.4603	469.5916	440.1169	415.0942	403.5322	405.4095 (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	56.0866	56.2293	56.3699	57.0397	57.1668	57.7660	57.7660	57.8783	57.5337	57.1668	56.9103	56.6445
alpha	4.7391	4.7486	4.7580	4.8026	4.8111	4.8511	4.8511	4.8586	4.8356	4.8111	4.7940	4.7763
util living area	0.9974	0.9960	0.9921	0.9790	0.9359	0.8199	0.6618	0.7142	0.9085	0.9827	0.9953	0.9979 (86)
MIT	19.6728	19.7859	20.0061	20.3271	20.6462	20.8841	20.9693	20.9556	20.7847	20.3966	19.9872	19.6555 (87)
Th 2	19.8896	19.8921	19.8945	19.9060	19.9082	19.9183	19.9183	19.9201	19.9144	19.9082	19.9038	19.8993 (88)
util rest of house	0.9966	0.9946	0.9891	0.9699	0.9052	0.7337	0.5203	0.5774	0.8521	0.9735	0.9934	0.9972 (89)
MIT 2	18.1311	18.2979	18.6205	19.0921	19.5369	19.8333	19.9060	19.9001	19.7265	19.1969	18.6005	18.1126 (90)
Living area fraction	18.7739	18.9183	19.1982	19.6070	19.9994	20.2714	20.3493	20.3402	20.1677	19.6971	19.1786	18.7559 (91)
MIT	18.7739	18.9183	19.1982	19.6070	19.9994	20.2714	20.3493	20.3402	20.1677	19.6971	19.1786	18.7559 (92)
Temperature adjustment	18.7739	18.9183	19.1982	19.6070	19.9994	20.2714	20.3493	20.3402	20.1677	19.6971	19.1786	18.7559 (93)
adjusted MIT	18.7739	18.9183	19.1982	19.6070	19.9994	20.2714	20.3493	20.3402	20.1677	19.6971	19.1786	18.7559 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9953	0.9929	0.9865	0.9667	0.9083	0.7651	0.5800	0.6347	0.8678	0.9711	0.9916	0.9961 (94)
Useful gains	419.3798	447.9447	471.0586	491.1669	483.1678	400.1566	289.0960	298.0701	381.9307	403.0980	400.1430	403.8279 (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	1191.9328	1151.4836	1040.4476	866.9920	670.5447	453.4625	299.7829	314.4299	487.1104	734.9960	980.2828	1186.8774 (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	574.7795	472.7781	423.6254	270.5940	139.4084	0.0000	0.0000	0.0000	0.0000	246.9321	417.7006	582.5888 (98)
Space heating												3128.4070 (98)
Space heating per m2												47.0366 (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													3345.8898 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	574.7795	472.7781	423.6254	270.5940	139.4084	0.0000	0.0000	0.0000	0.0000	246.9321	417.7006	582.5888	(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)	614.7374	505.6451	453.0753	289.4054	149.0999	0.0000	0.0000	0.0000	0.0000	264.0985	446.7386	623.0896	(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	188.6584	166.4111	175.0675	157.3513	154.4997	138.4830	133.4089	145.8247	145.3897	163.1440	171.9864	184.2593	(64)
Efficiency of water heater (217)m	87.5975	87.4473	87.0855	86.2478	84.5411	79.8000	79.8000	79.8000	79.8000	85.9168	87.0940	87.6753	(216)
Fuel for water heating, kWh/month	215.3696	190.2987	201.0295	182.4409	182.7509	173.5376	167.1791	182.7377	182.1926	189.8859	197.4721	210.1612	(219)
Water heating fuel used												2275.0558	(219)
Annual totals kWh/year													
Space heating fuel - main system												3345.8898	(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)												327.6409	(232)
Total delivered energy for all uses												6023.5865	(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	3345.8898	0.2160	722.7122 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2275.0558	0.2160	491.4120 (264)
Space and water heating			1214.1242 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	327.6409	0.5190	170.0456 (268)
Total CO2, kg/m2/year			1423.0949 (272)
Emissions per m2 for space and water heating			18.2548 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.5567 (272b)
Emissions per m2 for pumps and fans			0.5853 (272c)
Target Carbon Dioxide Emission Rate (TER) = (18.2548 * 1.55) + 2.5567 + 0.5853, rounded to 2 d.p.			31.4400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 13				Issued on Date	13/04/2022
Assessment Reference	Unit 13_Be Lean	Prop Type Ref	160 Malden Road			
Property	160, Malden Road					
SAP Rating	83 B	DER	19.35	TER	21.40	
Environmental	86 B	% DER<TER	9.57			
CO ₂ Emissions (t/year)	1.07	DFEE	56.52	TFEE	62.85	
General Requirements Compliance	Pass	% DFEE<TFEE	10.08			
Assessor Details	Mr. Andy Love, Love Design Studio Ltd, Tel: 07563755762, Mail@lovedesignstudio.co.uk				Assessor ID	U860-0001
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 67 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
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 21.40 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 19.35 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 62.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 56.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.22 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.100

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
x x

Efficiency: 90%
Minimum: 88% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage Nominal cylinder loss: 1.82 kWh/day
Permitted by DBSCG 2.10 OK
Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK
Independent timer for DHW OK

Boiler interlock Yes OK

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: 0.60
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: 11.88 m², No overhang
Windows facing South: 2.02 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Roof U-value 0.12 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	66.5100 (1b)	x 2.7000 (2b)	= 179.5770 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.5100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 179.5770 (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									1	(19)		
Shelter factor							(20) = 1 - [0.075 x (19)] =		0.9250	(20)		
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =		0.1388	(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)
	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (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	0.2987	0.2952	0.2917	0.2744	0.2709	0.2536	0.2536	0.2501	0.2605	0.2709	0.2778	0.2848 (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					
windows (Uw = 1.20)			13.9000	1.1450	15.9160		(27)					
Half glazed doors			6.2900	1.2000	7.5480		(26a)					
Solid Door			2.0500	1.4000	2.8700		(26)					
External Wall 1	70.3200	20.1900	50.1300	0.1400	7.0182		(29a)					
Corridor	4.0500	2.0500	2.0000	0.1342	0.2684		(29a)					
External Roof 1	66.5100		66.5100	0.1200	7.9812		(30)					
Total net area of external elements Aum(A, m2)			140.8800				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	41.6018		(33)					
Party Wall 1			19.6200	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (User defined value 0.100 * total exposed area)							14.0880 (36)					
Total fabric heat loss							(33) + (36) = 55.6898 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 17.6985	Feb 17.4929	Mar 17.2874	Apr 16.2596	May 16.0540	Jun 15.0262	Jul 15.0262	Aug 14.8207	Sep 15.4373	Oct 16.0540	Nov 16.4651	Dec 16.8763 (38)
Heat transfer coeff	73.3883	73.1827	72.9772	71.9494	71.7438	70.7160	70.7160	70.5104	71.1271	71.7438	72.1549	72.5660 (39)
Average = Sum(39)m / 12 =												71.8980 (39)
HLP	Jan 1.1034	Feb 1.1003	Mar 1.0972	Apr 1.0818	May 1.0787	Jun 1.0632	Jul 1.0632	Aug 1.0601	Sep 1.0694	Oct 1.0787	Nov 1.0849	Dec 1.0911 (40)
HLP (average)												1.0810 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1585 (42)
Average daily hot water use (litres/day)												85.4646 (43)
Daily hot water use	Jan 94.0111	Feb 90.5925	Mar 87.1739	Apr 83.7553	May 80.3367	Jun 76.9182	Jul 76.9182	Aug 80.3367	Sep 83.7553	Oct 87.1739	Nov 90.5925	Dec 94.0111 (44)
Energy conte	139.4157	121.9339	125.8248	109.6971	105.2570	90.8288	84.1662	96.5820	97.7355	113.9013	124.3322	135.0167 (45)
Energy content (annual)												Total = Sum(45)m = 1344.6912 (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

20.9124	18.2901	18.8737	16.4546	15.7886	13.6243	12.6249	14.4873	14.6603	17.0852	18.6498	20.2525 (46)
Water storage loss:											
Store volume											180.0000 (47)
b) If manufacturer declared loss factor is not known :											
Hot water storage loss factor from Table 2 (kWh/litre/day)											0.0115 (51)
Volume factor from Table 2a											0.8736 (52)
Temperature factor from Table 2b											0.5400 (53)
Enter (49) or (54) in (55)											0.9805 (55)
Total storage loss											
30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (56)
If cylinder contains dedicated solar storage											
30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (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											
193.0746	170.4000	179.4837	161.6251	158.9159	142.7568	137.8251	150.2409	149.6634	167.5602	176.2601	188.6756 (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											
193.0746	170.4000	179.4837	161.6251	158.9159	142.7568	137.8251	150.2409	149.6634	167.5602	176.2601	188.6756 (64)
Total per year (kWh/year) = Sum(64)m =											1976.4813 (64)
Heat gains from water heating, kWh/month											
89.2828	79.3159	84.7639	78.0167	77.9251	71.7429	70.9124	75.0406	74.0394	80.7993	82.8828	87.8202 (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	107.9255	107.9255	107.9255	107.9255	107.9255	107.9255	107.9255	107.9255	107.9255	107.9255	107.9255 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5											
16.9032	15.0133	12.2096	9.2435	6.9096	5.8334	6.3032	8.1931	10.9968	13.9629	16.2968	17.3730 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											
189.0186	190.9801	186.0373	175.5149	162.2322	149.7483	141.4083	139.4468	144.3896	154.9120	168.1947	180.6786 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
33.7926	33.7926	33.7926	33.7926	33.7926	33.7926	33.7926	33.7926	33.7926	33.7926	33.7926	33.7926 (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)											
-86.3404	-86.3404	-86.3404	-86.3404	-86.3404	-86.3404	-86.3404	-86.3404	-86.3404	-86.3404	-86.3404	-86.3404 (71)
Water heating gains (Table 5)											
120.0038	118.0296	113.9299	108.3565	104.7380	99.6430	95.3123	100.8610	102.8325	108.6012	115.1150	118.0378 (72)
Total internal gains											
384.3033	382.4006	370.5546	351.4925	332.2574	313.6023	301.4014	306.8786	316.5965	335.8538	357.9842	374.4671 (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					11.8800	10.6334	0.6300	0.7000	0.7700		38.6065 (74)	
South					2.0200	46.7521	0.6300	0.7000	0.7700		28.8618 (78)	
Solar gains	67.4683	121.0472	185.5798	269.4258	342.1834	358.6469	337.8069	279.8601	213.6314	138.8074	81.8372	57.1235 (83)
Total gains	451.7716	503.4478	556.1344	620.9183	674.4408	672.2492	639.2083	586.7387	530.2279	474.6612	439.8214	431.5907 (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	62.9358	63.1126	63.2904	64.1945	64.3784	65.3141	65.3141	65.5045	64.9366	64.3784	64.0116
alpha	5.1957	5.2075	5.2194	5.2796	5.2919	5.3543	5.3543	5.3670	5.3291	5.2919	5.2674
util living area											
0.9965	0.9931	0.9832	0.9453	0.8365	0.6445	0.4814	0.5423	0.8077	0.9647	0.9927	0.9972 (86)
MIT											
19.8957	20.0335	20.2709	20.5945	20.8526	20.9722	20.9951	20.9911	20.9104	20.5877	20.1907	19.8742 (87)
Th 2											
19.9980	20.0006	20.0031	20.0157	20.0183	20.0310	20.0310	20.0335	20.0259	20.0183	20.0132	20.0081 (88)
util rest of house											
0.9953	0.9909	0.9774	0.9262	0.7855	0.5587	0.3783	0.4338	0.7323	0.9485	0.9898	0.9963 (89)
MIT 2											
18.5329	18.7353	19.0803	19.5452	19.8779	20.0132	20.0292	20.0299	19.9562	19.5458	18.9742	18.5089 (90)
Living area fraction											
fLA = Living area / (4) =											
19.1011	19.2766	19.5767	19.9827	20.2843	20.4131	20.4319	20.4307	20.3540	19.9802	19.4814	19.0781 (92)
Temperature adjustment											
adjusted MIT	18.9511	19.1266	19.4267	19.8327	20.1343	20.2631	20.2819	20.2807	20.2040	19.8302	19.3314
											-0.1500
											18.9281 (93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9936	0.9881	0.9730	0.9219	0.7922	0.5801	0.4054	0.4622	0.7476	0.9446	0.9870
Useful gains	448.8633	497.4701	541.0963	572.4178	534.2774	389.9678	259.1069	271.1759	396.3934	448.3425	434.1195
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											
1075.2192	1041.1380	943.3549	786.5976	605.1061	400.4683	260.3699	273.6296	434.1625	662.2087	882.5540	1068.7606 (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											
466.0088	365.3448	299.2804	154.2095	52.6965	0.0000	0.0000	0.0000	0.0000	159.1164	322.8729	475.7090 (98)
Space heating											
											2295.2383 (98)
Space heating per m2											(98) / (4) =
											34.5097 (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

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 %)													89.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2564.5120 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	466.0088	365.3448	299.2804	154.2095	52.6965	0.0000	0.0000	0.0000	0.0000	159.1164	322.8729	475.7090	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	520.6802	408.2065	334.3915	172.3011	58.8788	0.0000	0.0000	0.0000	0.0000	177.7837	360.7518	531.5185	(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	193.0746	170.4000	179.4837	161.6251	158.9159	142.7568	137.8251	150.2409	149.6634	167.5602	176.2601	188.6756	(64)
Efficiency of water heater	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(216)
Fuel for water heating, kWh/month	215.7258	190.3910	200.5405	180.5867	177.5597	159.5048	153.9946	167.8669	167.2217	187.2181	196.9387	210.8107	(219)
Water heating fuel used												2208.3590	(219)
Annual totals kWh/year													
Space heating fuel - main system												2564.5120	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)													164.3130 (230a)
central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													194.3130 (231)
Electricity for lighting (calculated in Appendix L)													298.5163 (232)
Total delivered energy for all uses													5265.7002 (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	2564.5120	0.2160	553.9346 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2208.3590	0.2160	477.0055 (264)
Space and water heating			1030.9401 (265)
Pumps and fans	194.3130	0.5190	100.8484 (267)
Energy for lighting	298.5163	0.5190	154.9299 (268)
Total CO2, kg/year			1286.7185 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			19.3500 (273)

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

DER		19.3500	ZC1
Total Floor Area	TFA	66.5100	
Assumed number of occupants	N	2.1585	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.8408	ZC2
CO2 emissions from cooking, equation (L16)		2.5681	ZC3
Total CO2 emissions		38.7589	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		38.7589	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	66.5100 (1b)	x 2.7000 (2b)	= 179.5770 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	66.5100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 179.5770 (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) = 0.1114 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3614 (18)
Number of sides sheltered					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3343 (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	0.4262	0.4178	0.4095	0.3677	0.3593	0.3176	0.3176	0.3092	0.3343	0.3593	0.3761	0.3928 (22b)
Effective ac	0.5908	0.5873	0.5838	0.5676	0.5646	0.5504	0.5504	0.5478	0.5559	0.5646	0.5707	0.5771 (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			2.0500	1.0000	2.0500			(26)					
TER Semi-glazed door			6.2900	1.2000	7.5480			(26a)					
TER Opening Type (Uw = 1.40)			8.2800	1.3258	10.9773			(27)					
External Wall 1	70.3200	14.5700	55.7500	0.1800	10.0350			(29a)					
Corridor	4.0500	2.0500	2.0000	0.1800	0.3600			(29a)					
External Roof 1	66.5100		66.5100	0.1300	8.6463			(30)					
Total net area of external elements Aum(A, m2)			140.8800					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.6166			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								7.7215 (36)					
Total fabric heat loss						(33) + (36) =	47.3381	(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	35.0123	34.8033	34.5984	33.6362	33.4562	32.6182	32.6182	32.4630	32.9410	33.4562	33.8204	34.2011	(38)
Heat transfer coeff	82.3503	82.1414	81.9365	80.9743	80.7943	79.9562	79.9562	79.8011	80.2790	80.7943	81.1585	81.5392	(39)
Average = Sum(39)m / 12 =												80.9734	(39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2382	1.2350	1.2319	1.2175	1.2148	1.2022	1.2022	1.1998	1.2070	1.2148	1.2202	1.2260	(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												2.1585 (42)
Average daily hot water use (litres/day)												85.4646 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	94.0111	90.5925	87.1739	83.7553	80.3367	76.9182	76.9182	80.3367	83.7553	87.1739	90.5925	94.0111 (44)
Energy conte	139.4157	121.9339	125.8248	109.6971	105.2570	90.8288	84.1662	96.5820	97.7355	113.9013	124.3322	135.0167 (45)
Energy content (annual)											Total = Sum(45)m =	1344.6912 (45)
Distribution loss	(46)m = 0.15 x (45)m											
	20.9124	18.2901	18.8737	16.4546	15.7886	13.6243	12.6249	14.4873	14.6603	17.0852	18.6498	20.2525 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (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)												0.8381 (55)
Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (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	188.6584	166.4111	175.0675	157.3513	154.4997	138.4830	133.4089	145.8247	145.3897	163.1440	171.9864	184.2593 (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	188.6584	166.4111	175.0675	157.3513	154.4997	138.4830	133.4089	145.8247	145.3897	163.1440	171.9864	184.2593 (64)
Heat gains from water heating, kWh/month	85.7499	76.1248	81.2309	74.5977	74.3921	68.3239	67.3794	71.5076	70.6204	77.2663	79.4638	84.2872 (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	107.9255	107.9255	107.9255	107.9255	107.9255	107.9255	107.9255	107.9255	107.9255	107.9255	107.9255	107.9255	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5524	16.4781	13.4009	10.1453	7.5837	6.4025	6.9181	8.9925	12.0697	15.3252	17.8868	19.0680	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	189.0186	190.9801	186.0373	175.5149	162.2322	149.7483	141.4083	139.4468	144.3896	154.9120	168.1947	180.6786	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.7926	33.7926	33.7926	33.7926	33.7926	33.7926	33.7926	33.7926	33.7926	33.7926	33.7926	33.7926	(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)	-86.3404	-86.3404	-86.3404	-86.3404	-86.3404	-86.3404	-86.3404	-86.3404	-86.3404	-86.3404	-86.3404	-86.3404	(71)
Water heating gains (Table 5)	115.2552	113.2810	109.1813	103.6079	99.9894	94.8944	90.5637	96.1124	98.0839	103.8526	110.3664	113.2892	(72)
Total internal gains	381.2039	379.1168	366.9972	347.6457	328.1829	309.4228	297.2678	302.9294	312.9208	332.4675	354.8256	371.4135	(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					7.0800	10.6334	0.6300	0.7000			0.7700	23.0079 (74)
South					1.2000	46.7521	0.6300	0.7000			0.7700	17.1456 (78)

Solar gains	40.1535	72.0494	110.4837	160.4376	203.7927	213.6094	201.1925	166.6622	127.1962	82.6267	48.7066	33.9959 (83)
Total gains	421.3574	451.1662	477.4808	508.0833	531.9756	523.0322	498.4603	469.5916	440.1169	415.0942	403.5322	405.4095 (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	56.0866	56.2293	56.3699	57.0397	57.1668	57.7660	57.7660	57.8783	57.5337	57.1668	56.9103	56.6445
alpha	4.7391	4.7486	4.7580	4.8026	4.8111	4.8511	4.8511	4.8586	4.8356	4.8111	4.7940	4.7763
util living area	0.9974	0.9960	0.9921	0.9790	0.9359	0.8199	0.6618	0.7142	0.9085	0.9827	0.9953	0.9979 (86)
MIT	19.6728	19.7859	20.0061	20.3271	20.6462	20.8841	20.9693	20.9556	20.7847	20.3966	19.9872	19.6555 (87)
Th 2	19.8896	19.8921	19.8945	19.9060	19.9082	19.9183	19.9183	19.9201	19.9144	19.9082	19.9038	19.8993 (88)
util rest of house	0.9966	0.9946	0.9891	0.9699	0.9052	0.7337	0.5203	0.5774	0.8521	0.9735	0.9934	0.9972 (89)
MIT 2	18.1311	18.2979	18.6205	19.0921	19.5369	19.8333	19.9060	19.9001	19.7265	19.1969	18.6005	18.1126 (90)
Living area fraction	18.7739	18.9183	19.1982	19.6070	19.9994	20.2714	20.3493	20.3402	20.1677	19.6971	19.1786	18.7559 (91)
Temperature adjustment	18.7739	18.9183	19.1982	19.6070	19.9994	20.2714	20.3493	20.3402	20.1677	19.6971	19.1786	18.7559 (92)
adjusted MIT	18.7739	18.9183	19.1982	19.6070	19.9994	20.2714	20.3493	20.3402	20.1677	19.6971	19.1786	18.7559 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	419.3798	447.9447	471.0586	491.1669	483.1678	400.1566	289.0960	298.0701	381.9307	403.0980	400.1430	403.8279	(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	1191.9328	1151.4836	1040.4476	866.9920	670.5447	453.4625	299.7829	314.4299	487.1104	734.9960	980.2828	1186.8774	(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	574.7795	472.7781	423.6254	270.5940	139.4084	0.0000	0.0000	0.0000	0.0000	246.9321	417.7006	582.5888	(98)
Space heating												3128.4070	(98)
Space heating per m ²												47.0366	(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													3345.8898 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	574.7795	472.7781	423.6254	270.5940	139.4084	0.0000	0.0000	0.0000	0.0000	246.9321	417.7006	582.5888	(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)	614.7374	505.6451	453.0753	289.4054	149.0999	0.0000	0.0000	0.0000	0.0000	264.0985	446.7386	623.0896	(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	188.6584	166.4111	175.0675	157.3513	154.4997	138.4830	133.4089	145.8247	145.3897	163.1440	171.9864	184.2593	(64)
Efficiency of water heater (217)m	87.5975	87.4473	87.0855	86.2478	84.5411	79.8000	79.8000	79.8000	79.8000	85.9168	87.0940	87.6753	(216)
Fuel for water heating, kWh/month	215.3696	190.2987	201.0295	182.4409	182.7509	173.5376	167.1791	182.7377	182.1926	189.8859	197.4721	210.1612	(219)
Water heating fuel used												2275.0558	(219)
Annual totals kWh/year													
Space heating fuel - main system												3345.8898	(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)												327.6409	(232)
Total delivered energy for all uses												6023.5865	(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	3345.8898	0.2160	722.7122 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2275.0558	0.2160	491.4120 (264)
Space and water heating			1214.1242 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	327.6409	0.5190	170.0456 (268)
Total CO2, kg/m2/year			1423.0949 (272)
Emissions per m2 for space and water heating			18.2548 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.5567 (272b)
Emissions per m2 for pumps and fans			0.5853 (272c)
Target Carbon Dioxide Emission Rate (TER) = (18.2548 * 1.00) + 2.5567 + 0.5853, rounded to 2 d.p.			21.4000 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 14			Issued on Date	13/04/2022
Assessment Reference	Unit 14_Be Green	Prop Type Ref	160 Malden Road		
Property	160, Malden Road				
SAP Rating	88 B	DER	16.01	TER	29.03
Environmental	90 B	% DER<TER	44.85		
CO ₂ Emissions (t/year)	0.72	DFEE	45.02	TFEE	50.80
General Requirements Compliance	Pass	% DFEE<TFEE	11.37		
Assessor Details	Mr. Andy Love, Love Design Studio Ltd, Tel: 07563755762, Mail@lovedesignstudio.co.uk			Assessor ID	U860-0001
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 58 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

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 29.03 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 16.01 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)50.8 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)45.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.13 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.22 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.100

3 Air permeability

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

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric

Air-to-water heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 1.82 kWh/day	
Permitted by DBSCG 2.10	OK	
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
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Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK

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:	0.60	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley):	Medium	OK
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Based on:

Overshading:	Average
Windows facing South:	8.58 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

External wall U-value	0.14 W/m ² K
External wall U-value	0.14 W/m ² K
External wall U-value	0.14 W/m ² K
Party wall U-value	0.00 W/m ² K
Roof U-value	0.12 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	0.68 kW

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	58.1100 (1b)	x 2.7000 (2b)	= 156.8970 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.1100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 156.8970 (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					
windows (Uw = 1.20)			8.5800	1.1450	9.8244		(27)					
Half glazed doors			6.2900	1.2000	7.5480		(26a)					
Solid Door			2.0500	1.4000	2.8700		(26)					
External Wall 1	24.8700	14.8700	10.0000	0.1400	1.4000		(29a)					
Corridor	12.6400	2.0500	10.5900	0.1342	1.4209		(29a)					
stairs	14.4400		14.4400	0.1321	1.9068		(29a)					
External Roof 1	58.1100		58.1100	0.1200	6.9732		(30)					
Total net area of external elements Aum(A, m2)			110.0600				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.9434		(33)					
Party Wall 1			40.0000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (User defined value 0.100 * total exposed area)							11.0060 (36)					
Total fabric heat loss						(33) + (36) =	42.9494 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 14.7206	Feb 14.5555	Mar 14.3905	Apr 13.5653	May 13.4003	Jun 12.5751	Jul 12.5751	Aug 12.4101	Sep 12.9052	Oct 13.4003	Nov 13.7304	Dec 14.0604 (38)
Heat transfer coeff	57.6699	57.5049	57.3399	56.5147	56.3496	55.5245	55.5245	55.3594	55.8545	56.3496	56.6797	57.0098 (39)
Average = Sum(39)m / 12 =												56.4734 (39)
HLP	Jan 0.9924	Feb 0.9896	Mar 0.9867	Apr 0.9725	May 0.9697	Jun 0.9555	Jul 0.9555	Aug 0.9527	Sep 0.9612	Oct 0.9697	Nov 0.9754	Dec 0.9811 (40)
HLP (average)												0.9718 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9277 (42)
Average daily hot water use (litres/day)												79.9834 (43)
Daily hot water use	Jan 87.9818	Feb 84.7824	Mar 81.5831	Apr 78.3838	May 75.1844	Jun 71.9851	Jul 71.9851	Aug 75.1844	Sep 78.3838	Oct 81.5831	Nov 84.7824	Dec 87.9818 (44)
Energy conte	130.4744	114.1138	117.7552	102.6618	98.5065	85.0036	78.7683	90.3878	91.4673	106.5963	116.3582	126.3575 (45)
Energy content (annual)										Total = Sum(45)m =		1258.4508 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	19.5712	17.1171	17.6633	15.3993	14.7760	12.7505	11.8152	13.5582	13.7201	15.9895	17.4537	18.9536 (46)
Water storage loss:												
Store volume												180.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0115 (51)
Volume factor from Table 2a												0.8736 (52)
Temperature factor from Table 2b												0.5400 (53)
Enter (49) or (54) in (55)												0.9805 (55)
Total storage loss	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (56)
If cylinder contains dedicated solar storage	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (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	184.1333	162.5799	171.4141	154.5898	152.1653	136.9315	132.4272	144.0467	143.3953	160.2552	168.2862	180.0164 (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	184.1333	162.5799	171.4141	154.5898	152.1653	136.9315	132.4272	144.0467	143.3953	160.2552	168.2862	180.0164 (64)
Heat gains from water heating, kWh/month	86.3099	76.7157	82.0807	75.6774	75.6805	69.8061	69.1176	72.9810	71.9552	78.3704	80.2315	84.9410 (65)
Solar input (sum of months) = Sum(63)m =												
Total per year (kWh/year) = Sum(64)m =												

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	96.3862	96.3862	96.3862	96.3862	96.3862	96.3862	96.3862	96.3862	96.3862	96.3862	96.3862	96.3862 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.9000	14.1222	11.4850	8.6949	6.4995	5.4872	5.9291	7.7068	10.3441	13.1342	15.3296	16.3419 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	168.1564	169.9013	165.5042	156.1431	144.3264	133.2203	125.8008	124.0559	128.4531	137.8142	149.6309	160.7369 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.6386	32.6386	32.6386	32.6386	32.6386	32.6386	32.6386	32.6386	32.6386	32.6386	32.6386	32.6386 (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)	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089 (71)
Water heating gains (Table 5)	116.0079	114.1603	110.3235	105.1075	101.7211	96.9529	92.9000	98.0928	99.9378	105.3365	111.4326	114.1680 (72)
Total internal gains	354.9801	353.0997	342.2285	324.8613	307.4628	290.5762	279.5457	284.7714	293.6509	311.2008	331.3089	346.1626 (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
South					8.5800	46.7521		0.6300	0.7000	0.7700		122.5914 (78)
Solar gains	122.5914	200.7731	255.7493	289.0522	301.2103	289.8739	283.2245	275.0502	267.1603	216.5526	145.3126	105.9302 (83)
Total gains	477.5715	553.8728	597.9778	613.9135	608.6731	580.4501	562.7702	559.8216	560.8112	527.7534	476.6215	452.0929 (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	69.9744	70.1752	70.3772	71.4047	71.6139	72.6782	72.6782	72.8948	72.2487	71.6139	71.1968	70.7846
alpha	5.6650	5.6783	5.6918	5.7603	5.7743	5.8452	5.8452	5.8597	5.8166	5.7743	5.7465	5.7190
util living area	0.9904	0.9775	0.9517	0.8939	0.7818	0.5982	0.4322	0.4524	0.6609	0.8931	0.9772	0.9927 (86)
MIT	20.1845	20.3601	20.5630	20.7744	20.9195	20.9864	20.9982	20.9977	20.9753	20.8083	20.4624	20.1513 (87)
Th 2	20.0896	20.0920	20.0944	20.1063	20.1087	20.1206	20.1206	20.1230	20.1158	20.1087	20.1039	20.0991 (88)
util rest of house	0.9875	0.9711	0.9380	0.8650	0.7287	0.5220	0.3469	0.3675	0.5866	0.8588	0.9695	0.9905 (89)
MIT 2	19.0199	19.2733	19.5611	19.8561	20.0346	20.1120	20.1199	20.1220	20.0985	19.9065	19.4317	18.9791 (90)
Living area fraction	19.5594	19.7768	20.0252	20.2815	20.4445	20.5171	20.5268	20.5277	20.5047	20.3243	19.9091	19.5222 (92)
Temperature adjustment	19.5594	19.7768	20.0252	20.2815	20.4445	20.5171	20.5268	20.5277	20.5047	20.3243	19.9091	19.5222 (93)
adjusted MIT	19.5594	19.7768	20.0252	20.2815	20.4445	20.5171	20.5268	20.5277	20.5047	20.3243	19.9091	19.5222 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9854	0.9684	0.9368	0.8712	0.7497	0.5570	0.3865	0.4069	0.6202	0.8679	0.9675	0.9887 (94)
Useful gains	470.6061	536.3722	560.1720	534.8370	456.3424	323.3154	217.5101	227.7961	347.7905	458.0408	461.1341	446.9874 (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	880.0089	855.4872	775.5336	643.2225	492.7510	328.5417	218.0340	228.5069	357.7312	547.9602	726.0188	873.5131 (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	304.5957	214.4453	160.2291	78.0376	27.0880	0.0000	0.0000	0.0000	0.0000	66.9000	190.7170	317.3351 (98)
Space heating												1359.3477 (98)
Space heating per m2												(98) / (4) = 23.3927 (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

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 %)													175.1000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													776.3265 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	304.5957	214.4453	160.2291	78.0376	27.0880	0.0000	0.0000	0.0000	0.0000	66.9000	190.7170	317.3351	(98)
Space heating efficiency (main heating system 1)	175.1000	175.1000	175.1000	175.1000	175.1000	0.0000	0.0000	0.0000	0.0000	175.1000	175.1000	175.1000	(210)
Space heating fuel (main heating system)	173.9553	122.4702	91.5072	44.5674	15.4700	0.0000	0.0000	0.0000	0.0000	38.2067	108.9189	181.2308	(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	184.1333	162.5799	171.4141	154.5898	152.1653	136.9315	132.4272	144.0467	143.3953	160.2552	168.2862	180.0164	(64)
Efficiency of water heater	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)
Fuel for water heating, kWh/month	105.1589	92.8497	97.8950	88.2866	86.9020	78.2019	75.6295	82.2654	81.8934	91.5221	96.1086	102.8078	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													776.3265 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)													143.5608 (230a)
central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													173.5608 (231)
Electricity for lighting (calculated in Appendix L)													280.7991 (232)
Energy saving/generation technologies (Appendices M, N and Q)													
PV Unit 0 (0.80 * 0.68 * 951 * 1.00) =										-517.1351			-517.1351 (233)
Total delivered energy for all uses													1793.0720 (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	776.3265	0.5190	402.9135 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1079.5208	0.5190	560.2713 (264)
Space and water heating			963.1847 (265)
Pumps and fans	173.5608	0.5190	90.0780 (267)
Energy for lighting	280.7991	0.5190	145.7347 (268)
Energy saving/generation technologies			
PV Unit	-517.1351	0.5190	-268.3931 (269)
Total CO2, kg/year			930.6044 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			16.0100 (273)

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

DER			16.0100 ZC1
Total Floor Area		TFA	58.1100
Assumed number of occupants		N	1.9277
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			17.1478 ZC2
CO2 emissions from cooking, equation (L16)			2.8440 ZC3
Total CO2 emissions			36.0018 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			36.0018 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	58.1100 (1b)	x 2.7000 (2b)	= 156.8970 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.1100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 156.8970 (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) = 0.1275 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3775 (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) =				0.3209 (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	0.4091	0.4011	0.3930	0.3529	0.3449	0.3048	0.3048	0.2968	0.3209	0.3449	0.3610	0.3770 (22b)
	0.5837	0.5804	0.5772	0.5623	0.5595	0.5465	0.5465	0.5440	0.5515	0.5595	0.5651	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			2.0500	1.0000	2.0500		(26)
TER Semi-glazed door			6.2900	1.2000	7.5480		(26a)
TER Opening Type (Uw = 1.40)			6.1900	1.3258	8.2064		(27)
External Wall 1	24.8700	12.4800	12.3900	0.1800	2.2302		(29a)
Corridor	12.6400	2.0500	10.5900	0.1800	1.9062		(29a)
stairs	14.4400		14.4400	0.1800	2.5992		(29a)
External Roof 1	58.1100		58.1100	0.1300	7.5543		(30)
Total net area of external elements Aum(A, m ²)			110.0600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.0943		(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)							4.7685 (36)
Total fabric heat loss						(33) + (36) =	36.8628 (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	30.2204	30.0522	29.8873	29.1127	28.9678	28.2932	28.2932	28.1683	28.5531	28.9678	29.2610	29.5674 (38)
Heat transfer coeff	67.0832	66.9150	66.7501	65.9756	65.8306	65.1561	65.1561	65.0311	65.4159	65.8306	66.1238	66.4303 (39)
Average = Sum(39)m / 12 =												65.9749 (39)
HLP	1.1544	1.1515	1.1487	1.1354	1.1329	1.1213	1.1213	1.1191	1.1257	1.1329	1.1379	1.1432 (40)
HLP (average)												1.1353 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9277 (42)
Average daily hot water use (litres/day)												79.9834 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	87.9818	84.7824	81.5831	78.3838	75.1844	71.9851	71.9851	75.1844	78.3838	81.5831	84.7824	87.9818 (44)
Energy content (annual)	130.4744	114.1138	117.7552	102.6618	98.5065	85.0036	78.7683	90.3878	91.4673	106.5963	116.3582	126.3575 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1258.4508 (45)
Water storage loss:	19.5712	17.1171	17.6633	15.3993	14.7760	12.7505	11.8152	13.5582	13.7201	15.9895	17.4537	18.9536 (46)
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (48)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8381 (55)
Total storage loss												
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(56)
If cylinder contains dedicated solar storage												
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(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												
179.7171	158.5910	166.9979	150.3160	147.7491	132.6578	128.0110	139.6305	139.1215	155.8390	164.0124	175.6002	(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												
179.7171	158.5910	166.9979	150.3160	147.7491	132.6578	128.0110	139.6305	139.1215	155.8390	164.0124	175.6002	(64)
Heat gains from water heating, kWh/month												
82.7769	73.5246	78.5477	72.2584	72.1475	66.3871	65.5846	69.4481	68.5362	74.8374	76.8125	81.4080	(65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	96.3862	96.3862	96.3862	96.3862	96.3862	96.3862	96.3862	96.3862	96.3862	96.3862	96.3862	96.3862 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.0794	15.1698	12.3369	9.3398	6.9816	5.8942	6.3689	8.2785	11.1114	14.1085	16.4667	17.5541 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	168.1564	169.9013	165.5042	156.1431	144.3264	133.2203	125.8008	124.0559	128.4531	137.8142	149.6309	160.7369 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.6386	32.6386	32.6386	32.6386	32.6386	32.6386	32.6386	32.6386	32.6386	32.6386	32.6386	32.6386 (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)	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089 (71)
Water heating gains (Table 5)	111.2593	109.4116	105.5749	100.3589	96.9725	92.2042	88.1513	93.3442	95.1892	100.5879	106.6840	109.4194 (72)
Total internal gains	351.4109	349.3986	338.3318	320.7577	303.1963	286.2346	275.2369	280.5945	289.6696	307.4264	327.6974	342.6262 (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	

South					6.1900	46.7521	0.6300	0.7000			0.7700	88.4430 (78)	

Solar gains	88.4430	144.8468	184.5091	208.5353	217.3067	209.1282	204.3309	198.4336	192.7415	156.2308	104.8351	76.4229	(83)
Total gains	439.8539	494.2454	522.8409	529.2930	520.5031	495.3628	479.5679	479.0281	482.4111	463.6573	432.5324	419.0491	(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	60.1554	60.3066	60.4556	61.1653	61.3000	61.9346	61.9346	62.0536	61.6886	61.3000	61.0282	60.7466
alpha	5.0104	5.0204	5.0304	5.0777	5.0867	5.1290	5.1290	5.1369	5.1126	5.0867	5.0685	5.0498
util living area	0.9944	0.9891	0.9787	0.9544	0.8955	0.7574	0.5799	0.6024	0.8074	0.9510	0.9883	0.9955 (86)
MIT	19.8972	20.0492	20.2626	20.5250	20.7631	20.9320	20.9860	20.9828	20.8995	20.6049	20.2036	19.8691 (87)
Th 2	19.9566	19.9590	19.9613	19.9721	19.9741	19.9835	19.9835	19.9853	19.9799	19.9741	19.9700	19.9657 (88)
util rest of house	0.9925	0.9855	0.9715	0.9375	0.8541	0.6681	0.4550	0.4805	0.7296	0.9296	0.9838	0.9941 (89)
MIT 2	18.5050	18.7271	19.0364	19.4161	19.7363	19.9363	19.9782	19.9781	19.9022	19.5322	18.9606	18.4708 (90)
Living area fraction	19.1500	19.3395	19.6045	19.9298	20.2120	20.3976	20.4451	20.4435	20.3642	20.0291	19.5364	19.1186 (92)
Temperature adjustment	19.1500	19.3395	19.6045	19.9298	20.2120	20.3976	20.4451	20.4435	20.3642	20.0291	19.5364	19.1186 (93)
adjusted MIT	19.1500	19.3395	19.6045	19.9298	20.2120	20.3976	20.4451	20.4435	20.3642	20.0291	19.5364	19.1186 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9906	0.9828	0.9684	0.9367	0.8649	0.7069	0.5133	0.5373	0.7615	0.9309	0.9814	0.9925 (94)
Useful gains	435.7360	485.7554	506.3003	495.7932	450.1917	350.1808	246.1674	257.3695	367.3380	431.6329	424.4711	415.8999 (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	996.1833	966.2218	874.7234	727.6962	560.3484	377.7491	250.5305	262.9562	409.7802	620.7247	822.3453	991.0469 (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	416.9728	322.8734	274.1068	166.9702	81.9566	0.0000	0.0000	0.0000	0.0000	140.6843	286.4694	427.9094 (98)
Space heating												2117.9428 (98)
Space heating per m2												36.4471 (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													2265.1794 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	416.9728	322.8734	274.1068	166.9702	81.9566	0.0000	0.0000	0.0000	0.0000	140.6843	286.4694	427.9094	(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)	445.9602	345.3192	293.1623	178.5777	87.6541	0.0000	0.0000	0.0000	0.0000	150.4645	306.3844	457.6571	(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	179.7171	158.5910	166.9979	150.3160	147.7491	132.6578	128.0110	139.6305	139.1215	155.8390	164.0124	175.6002	(64)
Efficiency of water heater (217)m	86.9870	86.6720	86.1279	85.0945	83.3145	79.8000	79.8000	79.8000	79.8000	84.5424	86.2876	87.1018	(216)
Fuel for water heating, kWh/month	206.6022	182.9784	193.8953	176.6460	177.3390	166.2378	160.4148	174.9755	174.3377	184.3324	190.0765	201.6034	(219)
Water heating fuel used												2189.4390	(219)
Annual totals kWh/year													
Space heating fuel - main system												2265.1794	(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)												301.6279	(232)
Total delivered energy for all uses												4831.2464	(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	2265.1794	0.2160	489.2788 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2189.4390	0.2160	472.9188 (264)
Space and water heating			962.1976 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	301.6279	0.5190	156.5449 (268)
Total CO2, kg/m2/year			1157.6675 (272)
Emissions per m2 for space and water heating			16.5582 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.6939 (272b)
Emissions per m2 for pumps and fans			0.6699 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.5582 * 1.55) + 2.6939 + 0.6699, rounded to 2 d.p.			29.0300 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 14			Issued on Date	13/04/2022
Assessment Reference	Unit 14_Be Lean	Prop Type Ref	160 Malden Road		
Property	160, Malden Road				
SAP Rating	84 B	DER	17.40	TER	19.92
Environmental	88 B	% DER<TER	12.66		
CO ₂ Emissions (t/year)	0.86	DFEE	45.02	TFEE	50.80
General Requirements Compliance	Pass	% DFEE<TFEE	11.37		
Assessor Details	Mr. Andy Love, Love Design Studio Ltd, Tel: 07563755762, Mail@lovedesignstudio.co.uk			Assessor ID	U860-0001
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 58 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
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 19.92 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.40 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 50.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 45.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.13 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.22 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.100

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
x x

Efficiency: 90%
Minimum: 88% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage Nominal cylinder loss: 1.82 kWh/day
Permitted by DBSCG 2.10 OK
Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK
Independent timer for DHW OK

Boiler interlock Yes OK

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: 0.60
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 South: 9.58 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Roof U-value 0.12 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	58.1100 (1b)	x 2.7000 (2b)	= 156.8970 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.1100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 156.8970 (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					
windows (Uw = 1.20)			8.5800	1.1450	9.8244		(27)					
Half glazed doors			6.2900	1.2000	7.5480		(26a)					
Solid Door			2.0500	1.4000	2.8700		(26)					
External Wall 1	24.8700	14.8700	10.0000	0.1400	1.4000		(29a)					
Corridor	12.6400	2.0500	10.5900	0.1342	1.4209		(29a)					
stairs	14.4400		14.4400	0.1321	1.9068		(29a)					
External Roof 1	58.1100		58.1100	0.1200	6.9732		(30)					
Total net area of external elements Aum(A, m2)			110.0600				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.9434		(33)					
Party Wall 1			40.0000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (User defined value 0.100 * total exposed area)							11.0060 (36)					
Total fabric heat loss							(33) + (36) = 42.9494 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 14.7206	Feb 14.5555	Mar 14.3905	Apr 13.5653	May 13.4003	Jun 12.5751	Jul 12.5751	Aug 12.4101	Sep 12.9052	Oct 13.4003	Nov 13.7304	Dec 14.0604 (38)
Heat transfer coeff	57.6699	57.5049	57.3399	56.5147	56.3496	55.5245	55.5245	55.3594	55.8545	56.3496	56.6797	57.0098 (39)
Average = Sum(39)m / 12 =	56.4734 (39)											
HLP	Jan 0.9924	Feb 0.9896	Mar 0.9867	Apr 0.9725	May 0.9697	Jun 0.9555	Jul 0.9555	Aug 0.9527	Sep 0.9612	Oct 0.9697	Nov 0.9754	Dec 0.9811 (40)
HLP (average)	0.9718 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9277 (42)
Average daily hot water use (litres/day)												79.9834 (43)
Daily hot water use	Jan 87.9818	Feb 84.7824	Mar 81.5831	Apr 78.3838	May 75.1844	Jun 71.9851	Jul 71.9851	Aug 75.1844	Sep 78.3838	Oct 81.5831	Nov 84.7824	Dec 87.9818 (44)
Energy conte	130.4744	114.1138	117.7552	102.6618	98.5065	85.0036	78.7683	90.3878	91.4673	106.5963	116.3582	126.3575 (45)
Energy content (annual)												Total = Sum(45)m = 1258.4508 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	19.5712	17.1171	17.6633	15.3993	14.7760	12.7505	11.8152	13.5582	13.7201	15.9895	17.4537	18.9536 (46)
Water storage loss:												
Store volume												180.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0115 (51)
Volume factor from Table 2a												0.8736 (52)
Temperature factor from Table 2b												0.5400 (53)
Enter (49) or (54) in (55)												0.9805 (55)
Total storage loss	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (56)
If cylinder contains dedicated solar storage	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (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	184.1333	162.5799	171.4141	154.5898	152.1653	136.9315	132.4272	144.0467	143.3953	160.2552	168.2862	180.0164 (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	184.1333	162.5799	171.4141	154.5898	152.1653	136.9315	132.4272	144.0467	143.3953	160.2552	168.2862	180.0164 (64)
Heat gains from water heating, kWh/month	86.3099	76.7157	82.0807	75.6774	75.6805	69.8061	69.1176	72.9810	71.9552	78.3704	80.2315	84.9410 (65)
Solar input (sum of months) = Sum(63)m =												
Total per year (kWh/year) = Sum(64)m =												

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	96.3862	96.3862	96.3862	96.3862	96.3862	96.3862	96.3862	96.3862	96.3862	96.3862	96.3862	96.3862 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.9000	14.1222	11.4850	8.6949	6.4995	5.4872	5.9291	7.7068	10.3441	13.1342	15.3296	16.3419 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	168.1564	169.9013	165.5042	156.1431	144.3264	133.2203	125.8008	124.0559	128.4531	137.8142	149.6309	160.7369 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.6386	32.6386	32.6386	32.6386	32.6386	32.6386	32.6386	32.6386	32.6386	32.6386	32.6386	32.6386 (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)	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089 (71)
Water heating gains (Table 5)	116.0079	114.1603	110.3235	105.1075	101.7211	96.9529	92.9000	98.0928	99.9378	105.3365	111.4326	114.1680 (72)
Total internal gains	354.9801	353.0997	342.2285	324.8613	307.4628	290.5762	279.5457	284.7714	293.6509	311.2008	331.3089	346.1626 (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
South					8.5800	46.7521	0.6300	0.7000			0.7700			122.5914 (78)
Solar gains	122.5914	200.7731	255.7493	289.0522	301.2103	289.8739	283.2245	275.0502	267.1603	216.5526	145.3126	105.9302	(83)	
Total gains	477.5715	553.8728	597.9778	613.9135	608.6731	580.4501	562.7702	559.8216	560.8112	527.7534	476.6215	452.0929	(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	69.9744	70.1752	70.3772	71.4047	71.6139	72.6782	72.6782	72.8948	72.2487	71.6139	71.1968	70.7846
alpha	5.6650	5.6783	5.6918	5.7603	5.7743	5.8452	5.8452	5.8597	5.8166	5.7743	5.7465	5.7190
util living area	0.9904	0.9775	0.9517	0.8939	0.7818	0.5982	0.4322	0.4524	0.6609	0.8931	0.9772	0.9927 (86)
MIT	20.1845	20.3601	20.5630	20.7744	20.9195	20.9864	20.9982	20.9977	20.9753	20.8083	20.4624	20.1513 (87)
Th 2	20.0896	20.0920	20.0944	20.1063	20.1087	20.1206	20.1206	20.1230	20.1158	20.1087	20.1039	20.0991 (88)
util rest of house	0.9875	0.9711	0.9380	0.8650	0.7287	0.5220	0.3469	0.3675	0.5866	0.8588	0.9695	0.9905 (89)
MIT 2	19.0199	19.2733	19.5611	19.8561	20.0346	20.1120	20.1199	20.1220	20.0985	19.9065	19.4317	18.9791 (90)
Living area fraction	19.5594	19.7768	20.0252	20.2815	20.4445	20.5171	20.5268	20.5277	20.5047	20.3243	19.9091	19.5222 (92)
Temperature adjustment	19.4094	19.6268	19.8752	20.1315	20.2945	20.3671	20.3768	20.3777	20.3547	20.1743	19.7591	19.3722 (93)
adjusted MIT												

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9847	0.9670	0.9341	0.8659	0.7405	0.5439	0.3719	0.3923	0.6074	0.8616	0.9658	0.9882 (94)
Useful gains	470.2834	535.6081	558.5656	531.5946	450.7221	315.6993	209.2945	219.6380	340.6101	454.7144	460.3411	446.7447 (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	871.3584	846.8615	766.9326	634.7453	484.2986	320.2131	209.7053	220.2030	349.3531	539.5078	717.5168	864.9616 (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	298.3998	209.1622	155.0251	74.2685	24.9809	0.0000	0.0000	0.0000	0.0000	63.0863	185.1665	311.1533 (98)
Space heating												1321.2427 (98)
Space heating per m2												(98) / (4) = 22.7369 (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

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 %)													89.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1476.2489 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	298.3998	209.1622	155.0251	74.2685	24.9809	0.0000	0.0000	0.0000	0.0000	63.0863	185.1665	311.1533	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	333.4076	233.7008	173.2124	82.9816	27.9116	0.0000	0.0000	0.0000	0.0000	70.4875	206.8900	347.6574	(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	184.1333	162.5799	171.4141	154.5898	152.1653	136.9315	132.4272	144.0467	143.3953	160.2552	168.2862	180.0164	(64)
Efficiency of water heater (217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(216)
Fuel for water heating, kWh/month	205.7355	181.6535	191.5241	172.7260	170.0171	152.9961	147.9634	160.9460	160.2182	179.0561	188.0293	201.1356	(219)
Water heating fuel used													(219)
Annual totals kWh/year													
Space heating fuel - main system													1476.2489 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)													143.5608 (230a)
central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													173.5608 (231)
Electricity for lighting (calculated in Appendix L)													280.7991 (232)
Total delivered energy for all uses													4042.6096 (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	1476.2489	0.2160	318.8698 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2112.0009	0.2160	456.1922 (264)
Space and water heating			775.0620 (265)
Pumps and fans	173.5608	0.5190	90.0780 (267)
Energy for lighting	280.7991	0.5190	145.7347 (268)
Total CO2, kg/year			1010.8747 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			17.4000 (273)

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

DER			17.4000 ZC1
Total Floor Area		TFA	58.1100
Assumed number of occupants		N	1.9277
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			17.1478 ZC2
CO2 emissions from cooking, equation (L16)			2.8440 ZC3
Total CO2 emissions			37.3918 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			37.3918 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	58.1100 (1b)	x 2.7000 (2b)	= 156.8970 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	58.1100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 156.8970 (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					0.3775 (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) =				0.3209 (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	0.4091	0.4011	0.3930	0.3529	0.3449	0.3048	0.3048	0.2968	0.3209	0.3449	0.3610	0.3770 (22b)
	0.5837	0.5804	0.5772	0.5623	0.5595	0.5465	0.5465	0.5440	0.5515	0.5595	0.5651	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			2.0500	1.0000	2.0500		(26)
TER Semi-glazed door			6.2900	1.2000	7.5480		(26a)
TER Opening Type (Uw = 1.40)			6.1900	1.3258	8.2064		(27)
External Wall 1	24.8700	12.4800	12.3900	0.1800	2.2302		(29a)
Corridor	12.6400	2.0500	10.5900	0.1800	1.9062		(29a)
stairs	14.4400		14.4400	0.1800	2.5992		(29a)
External Roof 1	58.1100		58.1100	0.1300	7.5543		(30)
Total net area of external elements Aum(A, m ²)			110.0600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	32.0943		(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)							4.7685 (36)
Total fabric heat loss						(33) + (36) =	36.8628 (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	30.2204	30.0522	29.8873	29.1127	28.9678	28.2932	28.2932	28.1683	28.5531	28.9678	29.2610	29.5674 (38)
Heat transfer coeff	67.0832	66.9150	66.7501	65.9756	65.8306	65.1561	65.1561	65.0311	65.4159	65.8306	66.1238	66.4303 (39)
Average = Sum(39)m / 12 =												65.9749 (39)
HLP	1.1544	1.1515	1.1487	1.1354	1.1329	1.1213	1.1213	1.1191	1.1257	1.1329	1.1379	1.1432 (40)
HLP (average)												1.1353 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.9277 (42)
Average daily hot water use (litres/day)												79.9834 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	87.9818	84.7824	81.5831	78.3838	75.1844	71.9851	71.9851	75.1844	78.3838	81.5831	84.7824	87.9818 (44)
Energy content (annual)	130.4744	114.1138	117.7552	102.6618	98.5065	85.0036	78.7683	90.3878	91.4673	106.5963	116.3582	126.3575 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1258.4508 (45)
Water storage loss:	19.5712	17.1171	17.6633	15.3993	14.7760	12.7505	11.8152	13.5582	13.7201	15.9895	17.4537	18.9536 (46)
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5520 (48)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8381 (55)
Total storage loss												
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(56)
If cylinder contains dedicated solar storage												
25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(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												
179.7171	158.5910	166.9979	150.3160	147.7491	132.6578	128.0110	139.6305	139.1215	155.8390	164.0124	175.6002	(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												
179.7171	158.5910	166.9979	150.3160	147.7491	132.6578	128.0110	139.6305	139.1215	155.8390	164.0124	175.6002	(64)
Heat gains from water heating, kWh/month												
82.7769	73.5246	78.5477	72.2584	72.1475	66.3871	65.5846	69.4481	68.5362	74.8374	76.8125	81.4080	(65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	96.3862	96.3862	96.3862	96.3862	96.3862	96.3862	96.3862	96.3862	96.3862	96.3862	96.3862	96.3862 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.0794	15.1698	12.3369	9.3398	6.9816	5.8942	6.3689	8.2785	11.1114	14.1085	16.4667	17.5541 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	168.1564	169.9013	165.5042	156.1431	144.3264	133.2203	125.8008	124.0559	128.4531	137.8142	149.6309	160.7369 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.6386	32.6386	32.6386	32.6386	32.6386	32.6386	32.6386	32.6386	32.6386	32.6386	32.6386	32.6386 (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)	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089	-77.1089 (71)
Water heating gains (Table 5)	111.2593	109.4116	105.5749	100.3589	96.9725	92.2042	88.1513	93.3442	95.1892	100.5879	106.6840	109.4194 (72)
Total internal gains	351.4109	349.3986	338.3318	320.7577	303.1963	286.2346	275.2369	280.5945	289.6696	307.4264	327.6974	342.6262 (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

South					6.1900	46.7521	0.6300	0.7000	0.7700				88.4430 (78)

Solar gains	88.4430	144.8468	184.5091	208.5353	217.3067	209.1282	204.3309	198.4336	192.7415	156.2308	104.8351	76.4229	(83)
Total gains	439.8539	494.2454	522.8409	529.2930	520.5031	495.3628	479.5679	479.0281	482.4111	463.6573	432.5324	419.0491	(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)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
60.1554	60.3066	60.4556	61.1653	61.3000	61.9346	61.9346	62.0536	61.6886	61.3000	61.0282	60.7466	
alpha	5.0104	5.0204	5.0304	5.0777	5.0867	5.1290	5.1290	5.1369	5.1126	5.0867	5.0685	5.0498
util living area	0.9944	0.9891	0.9787	0.9544	0.8955	0.7574	0.5799	0.6024	0.8074	0.9510	0.9883	0.9955 (86)
MIT	19.8972	20.0492	20.2626	20.5250	20.7631	20.9320	20.9860	20.9828	20.8995	20.6049	20.2036	19.8691 (87)
Th 2	19.9566	19.9590	19.9613	19.9721	19.9741	19.9835	19.9835	19.9853	19.9799	19.9741	19.9700	19.9657 (88)
util rest of house	0.9925	0.9855	0.9715	0.9375	0.8541	0.6681	0.4550	0.4805	0.7296	0.9296	0.9838	0.9941 (89)
MIT 2	18.5050	18.7271	19.0364	19.4161	19.7363	19.9363	19.9782	19.9781	19.9022	19.5322	18.9606	18.4708 (90)
Living area fraction	19.1500	19.3395	19.6045	19.9298	20.2120	20.3976	20.4451	20.4435	20.3642	20.0291	19.5364	19.1186 (92)
Temperature adjustment	19.1500	19.3395	19.6045	19.9298	20.2120	20.3976	20.4451	20.4435	20.3642	20.0291	19.5364	19.1186 (93)
adjusted MIT	19.1500	19.3395	19.6045	19.9298	20.2120	20.3976	20.4451	20.4435	20.3642	20.0291	19.5364	19.1186 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9906	0.9828	0.9684	0.9367	0.8649	0.7069	0.5133	0.5373	0.7615	0.9309	0.9814	0.9925 (94)
Useful gains	435.7360	485.7554	506.3003	495.7932	450.1917	350.1808	246.1674	257.3695	367.3380	431.6329	424.4711	415.8999 (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	996.1833	966.2218	874.7234	727.6962	560.3484	377.7491	250.5305	262.9562	409.7802	620.7247	822.3453	991.0469 (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	416.9728	322.8734	274.1068	166.9702	81.9566	0.0000	0.0000	0.0000	0.0000	140.6843	286.4694	427.9094 (98)
Space heating												2117.9428 (98)
Space heating per m2												(98) / (4) = 36.4471 (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													2265.1794 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	416.9728	322.8734	274.1068	166.9702	81.9566	0.0000	0.0000	0.0000	0.0000	140.6843	286.4694	427.9094	(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)	445.9602	345.3192	293.1623	178.5777	87.6541	0.0000	0.0000	0.0000	0.0000	150.4645	306.3844	457.6571	(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	179.7171	158.5910	166.9979	150.3160	147.7491	132.6578	128.0110	139.6305	139.1215	155.8390	164.0124	175.6002	(64)
Efficiency of water heater (217)m	86.9870	86.6720	86.1279	85.0945	83.3145	79.8000	79.8000	79.8000	79.8000	84.5424	86.2876	87.1018	(216)
Fuel for water heating, kWh/month	206.6022	182.9784	193.8953	176.6460	177.3390	166.2378	160.4148	174.9755	174.3377	184.3324	190.0765	201.6034	(219)
Water heating fuel used												2189.4390	(219)
Annual totals kWh/year													
Space heating fuel - main system												2265.1794	(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)												301.6279	(232)
Total delivered energy for all uses												4831.2464	(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	2265.1794	0.2160	489.2788 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2189.4390	0.2160	472.9188 (264)
Space and water heating			962.1976 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	301.6279	0.5190	156.5449 (268)
Total CO2, kg/m2/year			1157.6675 (272)
Emissions per m2 for space and water heating			16.5582 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.6939 (272b)
Emissions per m2 for pumps and fans			0.6699 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.5582 * 1.00) + 2.6939 + 0.6699, rounded to 2 d.p.			19.9200 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 15			Issued on Date	13/04/2022
Assessment Reference	Unit 15_Be Green	Prop Type Ref	160 Malden Road		
Property	160, Malden Road				
SAP Rating	86 B	DER	15.35	TER	25.58
Environmental	87 B	% DER<TER	40.00		
CO ₂ Emissions (t/year)	1.27	DFEE	48.29	TFEE	55.85
General Requirements Compliance	Fail	% DFEE<TFEE	13.55		
Assessor Details	Mr. Andy Love, Love Design Studio Ltd, Tel: 07563755762, Mail@lovedesignstudio.co.uk			Assessor ID	U860-0001
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 105 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

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 25.58 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 15.35 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)55.9 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)48.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.21 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.100

3 Air permeability

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

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric

Air-to-water heat pump

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 1.82 kWh/day	
Permitted by DBSCG 2.10	OK	
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
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Hot water controls:	Cylinderstat	OK
	Independent timer for DHW	OK

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:	0.60	
Maximum	1.5	OK
MVHR efficiency:	89%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley):	High	Fail
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Based on:

Overshading:	Average	
Windows facing North:	10.80 m ² , No overhang	
Windows facing East:	13.26 m ² , No overhang	
Windows facing South:	18.94 m ² , No overhang	
Air change rate:	2.00 ach	
Blinds/curtains:	None	

10 Key features

External wall U-value	0.14 W/m ² K	
External wall U-value	0.14 W/m ² K	
External wall U-value	0.14 W/m ² K	
Party wall U-value	0.00 W/m ² K	
Roof U-value	0.12 W/m ² K	
Air permeability	3.0 m ³ /m ² h	
Photovoltaic array	0.68 kW	

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	104.8000 (1b)	x 2.7000 (2b)	= 282.9600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	104.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 282.9600 (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					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (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	0.2987	0.2952	0.2917	0.2744	0.2709	0.2536	0.2536	0.2501	0.2605	0.2709	0.2778	0.2848 (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					
windows (Uw = 1.20)			43.0000	1.1450	49.2366		(27)					
Solid Door			2.0500	1.4000	2.8700		(26)					
External Wall 1	87.3500	43.0000	44.3500	0.1400	6.2090		(29a)					
Corridor	4.0500	2.0500	2.0000	0.1342	0.2684		(29a)					
stairs	14.9800		14.9800	0.1321	1.9781		(29a)					
External Roof 1	104.8000		104.8000	0.1200	12.5760		(30)					
Total net area of external elements Aum(A, m2)			211.1800				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		73.1381		(33)					
Party Wall 1			12.9700	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (User defined value 0.100 * total exposed area)							21.1180 (36)					
Total fabric heat loss							(33) + (36) = 94.2561 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 27.8876	Feb 27.5637	Mar 27.2398	Apr 25.6203	May 25.2964	Jun 23.6769	Jul 23.6769	Aug 23.3530	Sep 24.3247	Oct 25.2964	Nov 25.9442	Dec 26.5920 (38)
Heat transfer coeff	122.1437	121.8198	121.4959	119.8764	119.5525	117.9330	117.9330	117.6091	118.5808	119.5525	120.2003	120.8481 (39)
Average = Sum(39)m / 12 =												119.7954 (39)
HLP	Jan 1.1655	Feb 1.1624	Mar 1.1593	Apr 1.1439	May 1.1408	Jun 1.1253	Jul 1.1253	Aug 1.1222	Sep 1.1315	Oct 1.1408	Nov 1.1469	Dec 1.1531 (40)
HLP (average)												1.1431 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7797 (42)
Average daily hot water use (litres/day)												100.2188 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	110.2407	106.2319	102.2232	98.2144	94.2057	90.1969	90.1969	94.2057	98.2144	102.2232	106.2319	110.2407 (44)
Energy conte	163.4838	142.9840	147.5466	128.6347	123.4281	106.5091	98.6963	113.2554	114.6081	133.5647	145.7963	158.3253 (45)
Energy content (annual)												Total = Sum(45)m = 1576.8323 (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

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 %)																175.1000	(206)
Efficiency of secondary/supplementary heating system, %																0.0000	(208)
Space heating requirement																1650.4157	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Space heating requirement	708.2287	456.0290	283.6816	95.5834	21.1771	0.0000	0.0000	0.0000	0.0000	134.3460	444.7206	746.1116	(98)				
Space heating efficiency (main heating system 1)	175.1000	175.1000	175.1000	175.1000	175.1000	0.0000	0.0000	0.0000	0.0000	175.1000	175.1000	175.1000	(210)				
Space heating fuel (main heating system)	404.4710	260.4392	162.0112	54.5879	12.0943	0.0000	0.0000	0.0000	0.0000	76.7253	253.9809	426.1060	(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	217.1427	191.4500	201.2055	180.5627	177.0870	158.4370	152.3552	166.9143	166.5360	187.2235	197.7242	211.9842	(64)				
Efficiency of water heater (217)m	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	175.1000	(216)				
Fuel for water heating, kWh/month	124.0107	109.3375	114.9089	103.1197	101.1348	90.4837	87.0104	95.3251	95.1091	106.9238	112.9207	121.0646	(219)				
Water heating fuel used												1261.3491	(219)				
Annual totals kWh/year																	
Space heating fuel - main system												1650.4157	(211)				
Space heating fuel - secondary												0.0000	(215)				
Electricity for pumps and fans:																	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)																	
mechanical ventilation fans (SFP = 0.7500)													258.9084	(230a)			
central heating pump													30.0000	(230c)			
Total electricity for the above, kWh/year													288.9084	(231)			
Electricity for lighting (calculated in Appendix L)													415.4326	(232)			
Energy saving/generation technologies (Appendices M ,N and Q)																	
PV Unit 0 (0.80 * 0.68 * 951 * 1.00) =													-517.1351	(233)			
Total delivered energy for all uses													3098.9708	(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	1650.4157	0.5190	856.5658 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1261.3491	0.5190	654.6402 (264)
Space and water heating			1511.2059 (265)
Pumps and fans	288.9084	0.5190	149.9435 (267)
Energy for lighting	415.4326	0.5190	215.6095 (268)
Energy saving/generation technologies			
PV Unit	-517.1351	0.5190	-268.3931 (269)
Total CO2, kg/year			1608.3658 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			15.3500 (273)

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

DER			15.3500	ZC1
Total Floor Area		TFA	104.8000	
Assumed number of occupants		N	2.7797	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			14.9198	ZC2
CO2 emissions from cooking, equation (L16)			1.7721	ZC3
Total CO2 emissions			32.0419	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			32.0419	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	104.8000 (1b)	x 2.7000 (2b)	= 282.9600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	104.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 282.9600 (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				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) = 0.1414 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3914 (18)
Number of sides sheltered					1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3620 (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	0.4616	0.4525	0.4435	0.3982	0.3892	0.3439	0.3439	0.3349	0.3620	0.3892	0.4073	0.4254 (22b)
Effective ac	0.6065	0.6024	0.5983	0.5793	0.5757	0.5591	0.5591	0.5561	0.5655	0.5757	0.5829	0.5905 (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			2.0500	1.0000	2.0500		(26)
TER Opening Type (Uw = 1.40)			24.1600	1.3258	32.0303		(27)
External Wall 1	87.3500	24.1600	63.1900	0.1800	11.3742		(29a)
Corridor	4.0500	2.0500	2.0000	0.1800	0.3600		(29a)
stairs	14.9800		14.9800	0.1800	2.6964		(29a)
External Roof 1	104.8000		104.8000	0.1300	13.6240		(30)
Total net area of external elements Aum(A, m ²)			211.1800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	62.1349		(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)							13.1755 (36)
Total fabric heat loss						(33) + (36) =	75.3104 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	56.6349	56.2487	55.8701	54.0919	53.7592	52.2104	52.2104	51.9236	52.8070	53.7592	54.4322	55.1359 (38)
Heat transfer coeff	131.9453	131.5591	131.1805	129.4023	129.0696	127.5208	127.5208	127.2340	128.1174	129.0696	129.7426	130.4463 (39)
Average = Sum(39)m / 12 =												129.4007 (39)
HLP	1.2590	1.2553	1.2517	1.2348	1.2316	1.2168	1.2168	1.2141	1.2225	1.2316	1.2380	1.2447 (40)
HLP (average)												1.2347 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7797 (42)
Average daily hot water use (litres/day)												100.2188 (43)
Daily hot water use	110.2407	106.2319	102.2232	98.2144	94.2057	90.1969	90.1969	94.2057	98.2144	102.2232	106.2319	110.2407 (44)
Energy conte	163.4838	142.9840	147.5466	128.6347	123.4281	106.5091	98.6963	113.2554	114.6081	133.5647	145.7963	158.3253 (45)
Energy content (annual)										Total = Sum(45)m =		1576.8323 (45)
Distribution loss (46)m = 0.15 x (45)m	24.5226	21.4476	22.1320	19.2952	18.5142	15.9764	14.8044	16.9883	17.1912	20.0347	21.8694	23.7488 (46)
Water storage loss:												180.0000 (47)
Store volume												1.5520 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)												0.8381 (55)
Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (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	212.7264	187.4612	196.7893	176.2889	172.6708	154.1632	147.9390	162.4981	162.2623	182.8073	193.4505	207.5680 (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	212.7264	187.4612	196.7893	176.2889	172.6708	154.1632	147.9390	162.4981	162.2623	182.8073	193.4505	207.5680 (64)
Heat gains from water heating, kWh/month	93.7525	83.1240	88.4534	80.8944	80.4340	73.5376	72.2107	77.0516	76.2305	83.8044	86.6006	92.0373 (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	138.9870	138.9870	138.9870	138.9870	138.9870	138.9870	138.9870	138.9870	138.9870	138.9870	138.9870	138.9870	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.5235	20.8934	16.9916	12.8638	9.6158	8.1181	8.7719	11.4020	15.3037	19.4316	22.6796	24.1773	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	263.8623	266.6004	259.7005	245.0116	226.4694	209.0425	197.4001	194.6621	201.5619	216.2509	234.7930	252.2200	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.8987	36.8987	36.8987	36.8987	36.8987	36.8987	36.8987	36.8987	36.8987	36.8987	36.8987	36.8987	(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)	-111.1896	-111.1896	-111.1896	-111.1896	-111.1896	-111.1896	-111.1896	-111.1896	-111.1896	-111.1896	-111.1896	-111.1896	(71)
Water heating gains (Table 5)	126.0114	123.6964	118.8890	112.3533	108.1102	102.1356	97.0573	103.5639	105.8758	112.6403	120.2786	123.7060	(72)
Total internal gains	481.0933	478.8862	463.2772	437.9248	411.8915	386.9922	370.9254	377.3241	390.4375	416.0189	445.4473	467.7994	(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					6.0700	10.6334		0.6300	0.7000	0.7700		19.7257 (74)	
East					7.4500	19.6403		0.6300	0.7000	0.7700		44.7173 (76)	
South					10.6400	46.7521		0.6300	0.7000	0.7700		152.0247 (78)	

Solar gains	216.4677	374.1506	525.2704	671.4471	769.6232	771.4375	740.7019	666.5536	575.8692	417.2168	260.2925	184.5810	(83)
Total gains	697.5610	853.0369	988.5476	1109.3719	1181.5147	1158.4297	1111.6273	1043.8777	966.3067	833.2357	705.7398	652.3804	(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	55.1575	55.3195	55.4791	56.2415	56.3865	57.0713	57.0713	57.1999	56.8055	56.3865	56.0940	55.7914
alpha	4.6772	4.6880	4.6986	4.7494	4.7591	4.8048	4.8048	4.8133	4.7870	4.7591	4.7396	4.7194
util living area	0.9968	0.9915	0.9773	0.9342	0.8328	0.6600	0.4952	0.5449	0.7884	0.9581	0.9928	0.9977 (86)
MIT	19.6748	19.8813	20.1764	20.5328	20.8090	20.9543	20.9906	20.9854	20.8920	20.5196	20.0274	19.6428 (87)
Th 2	19.8731	19.8760	19.8788	19.8923	19.8948	19.9066	19.9066	19.9088	19.9020	19.8948	19.8897	19.8844 (88)
util rest of house	0.9958	0.9887	0.9694	0.9111	0.7777	0.5650	0.3771	0.4235	0.7045	0.9386	0.9899	0.9969 (89)
MIT 2	18.1225	18.4248	18.8521	19.3602	19.7153	19.8777	19.9034	19.9032	19.8210	19.3547	18.6486	18.0837 (90)
Living area fraction												
MIT	18.7470	19.0108	19.3849	19.8319	20.1552	20.3108	20.3407	20.3386	20.2518	19.8233	19.2033	0.4023 (91)
Temperature adjustment												
adjusted MIT	18.7470	19.0108	19.3849	19.8319	20.1552	20.3108	20.3407	20.3386	20.2518	19.8233	19.2033	0.0000 (92)
												18.7109 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9942	0.9857	0.9650	0.9096	0.7920	0.6017	0.4249	0.4727	0.7338	0.9370	0.9874	0.9957	(94)
Ext temp.	693.5324	840.8510	953.9078	1009.1273	935.7675	697.0725	472.3138	493.3915	709.0541	780.7377	696.8758	649.5709	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.4000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1906.2151	1856.3987	1690.2443	1414.6157	1091.3151	728.2519	477.0228	501.1180	788.1576	1190.4526	1570.3108	1892.8914	(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	902.2359	682.4480	547.8344	291.9516	115.7274	0.0000	0.0000	0.0000	0.0000	304.8279	628.8733	925.0305	(98)
Space heating per m2												4398.9290	(98)
												(98) / (4) =	41.9745 (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													4704.7369 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	902.2359	682.4480	547.8344	291.9516	115.7274	0.0000	0.0000	0.0000	0.0000	304.8279	628.8733	925.0305	(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)	964.9582	729.8910	585.9191	312.2477	123.7726	0.0000	0.0000	0.0000	0.0000	326.0192	672.5917	989.3374	(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	212.7264	187.4612	196.7893	176.2889	172.6708	154.1632	147.9390	162.4981	162.2623	182.8073	193.4505	207.5680	(64)
Efficiency of water heater (217)m	88.2425	87.9585	87.4028	86.1509	83.7746	79.8000	79.8000	79.8000	79.8000	86.1686	87.7326	79.8000	(216)
Fuel for water heating, kWh/month	241.0702	213.1247	225.1522	204.6280	206.1135	193.1870	185.3872	203.6317	203.3362	212.1507	220.5000	234.9930	(219)
Water heating fuel used												2543.2745	(219)
Annual totals kWh/year													
Space heating fuel - main system												4704.7369	(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)												415.4326	(232)
Total delivered energy for all uses												7738.4440	(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	4704.7369	0.2160	1016.2232 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2543.2745	0.2160	549.3473 (264)
Space and water heating			1565.5705 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	415.4326	0.5190	215.6095 (268)
Total CO2, kg/m2/year			1820.1050 (272)
Emissions per m2 for space and water heating			14.9386 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.0573 (272b)
Emissions per m2 for pumps and fans			0.3714 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.9386 * 1.55) + 2.0573 + 0.3714, rounded to 2 d.p.			25.5800 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 15			Issued on Date	13/04/2022
Assessment Reference	Unit 15_Be Lean	Prop Type Ref	160 Malden Road		
Property	160, Malden Road				
SAP Rating	85 B	DER	15.06	TER	17.37
Environmental	87 B	% DER<TER	13.29		
CO ₂ Emissions (t/year)	1.32	DFEE	48.29	TFEE	55.85
General Requirements Compliance	Fail	% DFEE<TFEE	13.55		
Assessor Details	Mr. Andy Love, Love Design Studio Ltd, Tel: 07563755762, Mail@lovedesignstudio.co.uk			Assessor ID	U860-0001
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 105 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
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.37 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.06 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)55.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)48.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.14 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.21 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated using user-specified y-value of 0.100

3 Air permeability

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

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from manufacturer
x x

Efficiency: 90%
Minimum: 88% OK

Secondary heating system: None

5 Cylinder insulation

Hot water storage Nominal cylinder loss: 1.82 kWh/day
Permitted by DBSCG 2.10 OK
Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK
Independent timer for DHW OK

Boiler interlock Yes OK

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: 0.60
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: 10.80 m², No overhang
Windows facing East: 13.26 m², No overhang
Windows facing South: 18.94 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Roof U-value 0.12 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	104.8000 (1b)	x 2.7000 (2b)	= 282.9600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	104.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 282.9600 (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								1	(19)			
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.9250	(20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1388	(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)
	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (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	0.2987	0.2952	0.2917	0.2744	0.2709	0.2536	0.2536	0.2501	0.2605	0.2709	0.2778	0.2848 (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					
windows (Uw = 1.20)			43.0000	1.1450	49.2366		(27)					
Solid Door			2.0500	1.4000	2.8700		(26)					
External Wall 1	87.3500	43.0000	44.3500	0.1400	6.2090		(29a)					
Corridor	4.0500	2.0500	2.0000	0.1342	0.2684		(29a)					
stairs	14.9800		14.9800	0.1321	1.9781		(29a)					
External Roof 1	104.8000		104.8000	0.1200	12.5760		(30)					
Total net area of external elements Aum(A, m2)			211.1800				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		73.1381		(33)					
Party Wall 1			12.9700	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (User defined value 0.100 * total exposed area)							21.1180 (36)					
Total fabric heat loss						(33) + (36) =	94.2561 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 27.8876	Feb 27.5637	Mar 27.2398	Apr 25.6203	May 25.2964	Jun 23.6769	Jul 23.6769	Aug 23.3530	Sep 24.3247	Oct 25.2964	Nov 25.9442	Dec 26.5920 (38)
Heat transfer coeff	122.1437	121.8198	121.4959	119.8764	119.5525	117.9330	117.9330	117.6091	118.5808	119.5525	120.2003	120.8481 (39)
Average = Sum(39)m / 12 =												119.7954 (39)
HLP	Jan 1.1655	Feb 1.1624	Mar 1.1593	Apr 1.1439	May 1.1408	Jun 1.1253	Jul 1.1253	Aug 1.1222	Sep 1.1315	Oct 1.1408	Nov 1.1469	Dec 1.1531 (40)
HLP (average)												1.1431 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7797 (42)
Average daily hot water use (litres/day)												100.2188 (43)
Daily hot water use	Jan 110.2407	Feb 106.2319	Mar 102.2232	Apr 98.2144	May 94.2057	Jun 90.1969	Jul 90.1969	Aug 94.2057	Sep 98.2144	Oct 102.2232	Nov 106.2319	Dec 110.2407 (44)
Energy conte	163.4838	142.9840	147.5466	128.6347	123.4281	106.5091	98.6963	113.2554	114.6081	133.5647	145.7963	158.3253 (45)
Energy content (annual)										Total = Sum(45)m =		1576.8323 (45)
Distribution loss (46)m = 0.15 x (45)m												

	24.5226	21.4476	22.1320	19.2952	18.5142	15.9764	14.8044	16.9883	17.1912	20.0347	21.8694	23.7488 (46)
Water storage loss:												
Store volume												180.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0115 (51)
Volume factor from Table 2a												0.8736 (52)
Temperature factor from Table 2b												0.5400 (53)
Enter (49) or (54) in (55)												0.9805 (55)
Total storage loss												
	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (56)
If cylinder contains dedicated solar storage												
	30.3965	27.4549	30.3965	29.4160	30.3965	29.4160	30.3965	30.3965	29.4160	30.3965	29.4160	30.3965 (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												
	217.1427	191.4500	201.2055	180.5627	177.0870	158.4370	152.3552	166.9143	166.5360	187.2235	197.7242	211.9842 (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												
	217.1427	191.4500	201.2055	180.5627	177.0870	158.4370	152.3552	166.9143	166.5360	187.2235	197.7242	211.9842 (64)
								Total per year (kWh/year) =	Sum (64)m =			2208.6223 (64)
Heat gains from water heating, kWh/month												
	97.2855	86.3150	91.9864	84.3134	83.9669	76.9566	75.7436	80.5845	79.6495	87.3374	90.0196	95.5703 (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

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 %)													89.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3146.9410 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	694.9800	445.0265	273.9957	90.5143	19.4279	0.0000	0.0000	0.0000	0.0000	126.9058	432.7814	732.8807	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	776.5140	497.2363	306.1405	101.1333	21.7071	0.0000	0.0000	0.0000	0.0000	141.7942	483.5547	818.8611	(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	217.1427	191.4500	201.2055	180.5627	177.0870	158.4370	152.3552	166.9143	166.5360	187.2235	197.7242	211.9842	(64)
Efficiency of water heater (217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(216)
Fuel for water heating, kWh/month	242.6175	213.9107	224.8106	201.7460	197.8625	177.0246	170.2292	186.4964	186.0738	209.1883	220.9209	236.8538	(219)
Water heating fuel used												2467.7344	(219)
Annual totals kWh/year													
Space heating fuel - main system												3146.9410	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7500)													
mechanical ventilation fans (SFP = 0.7500)													258.9084 (230a)
central heating pump													30.0000 (230c)
Total electricity for the above, kWh/year													288.9084 (231)
Electricity for lighting (calculated in Appendix L)													415.4326 (232)
Total delivered energy for all uses													6319.0165 (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	3146.9410	0.2160	679.7393	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2467.7344	0.2160	533.0306	(264)
Space and water heating			1212.7699	(265)
Pumps and fans	288.9084	0.5190	149.9435	(267)
Energy for lighting	415.4326	0.5190	215.6095	(268)
Total CO2, kg/year			1578.3229	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			15.0600	(273)

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

DER			15.0600	ZC1
Total Floor Area		TFA	104.8000	
Assumed number of occupants		N	2.7797	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			14.9198	ZC2
CO2 emissions from cooking, equation (L16)			1.7721	ZC3
Total CO2 emissions			31.7519	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			31.7519	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	104.8000 (1b)	x 2.7000 (2b)	= 282.9600 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	104.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 282.9600 (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				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) = 0.1414 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3914 (18)
Number of sides sheltered					1 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3620 (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	0.4616	0.4525	0.4435	0.3982	0.3892	0.3439	0.3439	0.3349	0.3620	0.3892	0.4073	0.4254 (22b)
Effective ac	0.6065	0.6024	0.5983	0.5793	0.5757	0.5591	0.5591	0.5561	0.5655	0.5757	0.5829	0.5905 (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			2.0500	1.0000	2.0500			(26)					
TER Opening Type (Uw = 1.40)			24.1600	1.3258	32.0303			(27)					
External Wall 1	87.3500	24.1600	63.1900	0.1800	11.3742			(29a)					
Corridor	4.0500	2.0500	2.0000	0.1800	0.3600			(29a)					
stairs	14.9800		14.9800	0.1800	2.6964			(29a)					
External Roof 1	104.8000		104.8000	0.1300	13.6240			(30)					
Total net area of external elements Aum(A, m2)			211.1800					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	62.1349			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								13.1755 (36)					
Total fabric heat loss						(33) + (36) =	75.3104	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 56.6349	Feb 56.2487	Mar 55.8701	Apr 54.0919	May 53.7592	Jun 52.2104	Jul 52.2104	Aug 51.9236	Sep 52.8070	Oct 53.7592	Nov 54.4322	Dec 55.1359	(38)
Heat transfer coeff	131.9453	131.5591	131.1805	129.4023	129.0696	127.5208	127.5208	127.2340	128.1174	129.0696	129.7426	130.4463	(39)
Average = Sum(39)m / 12 =												129.4007	(39)
HLP	Jan 1.2590	Feb 1.2553	Mar 1.2517	Apr 1.2348	May 1.2316	Jun 1.2168	Jul 1.2168	Aug 1.2141	Sep 1.2225	Oct 1.2316	Nov 1.2380	Dec 1.2447	(40)
HLP (average)												1.2347	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.7797 (42)
Average daily hot water use (litres/day)												100.2188 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	110.2407	106.2319	102.2232	98.2144	94.2057	90.1969	90.1969	94.2057	98.2144	102.2232	106.2319	110.2407 (44)
Energy conte	163.4838	142.9840	147.5466	128.6347	123.4281	106.5091	98.6963	113.2554	114.6081	133.5647	145.7963	158.3253 (45)
Energy content (annual)										Total = Sum(45)m =		1576.8323 (45)
Distribution loss (46)m = 0.15 x (45)m	24.5226	21.4476	22.1320	19.2952	18.5142	15.9764	14.8044	16.9883	17.1912	20.0347	21.8694	23.7488 (46)
Water storage loss:												180.0000 (47)
Store volume												1.5520 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)												0.8381 (55)
Total storage loss	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (56)
If cylinder contains dedicated solar storage	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803 (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	212.7264	187.4612	196.7893	176.2889	172.6708	154.1632	147.9390	162.4981	162.2623	182.8073	193.4505	207.5680 (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	212.7264	187.4612	196.7893	176.2889	172.6708	154.1632	147.9390	162.4981	162.2623	182.8073	193.4505	207.5680 (64)
Heat gains from water heating, kWh/month	93.7525	83.1240	88.4534	80.8944	80.4340	73.5376	72.2107	77.0516	76.2305	83.8044	86.6006	92.0373 (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	138.9870	138.9870	138.9870	138.9870	138.9870	138.9870	138.9870	138.9870	138.9870	138.9870	138.9870	138.9870	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.5235	20.8934	16.9916	12.8638	9.6158	8.1181	8.7719	11.4020	15.3037	19.4316	22.6796	24.1773	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	263.8623	266.6004	259.7005	245.0116	226.4694	209.0425	197.4001	194.6621	201.5619	216.2509	234.7930	252.2200	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.8987	36.8987	36.8987	36.8987	36.8987	36.8987	36.8987	36.8987	36.8987	36.8987	36.8987	36.8987	(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)	-111.1896	-111.1896	-111.1896	-111.1896	-111.1896	-111.1896	-111.1896	-111.1896	-111.1896	-111.1896	-111.1896	-111.1896	(71)
Water heating gains (Table 5)	126.0114	123.6964	118.8890	112.3533	108.1102	102.1356	97.0573	103.5639	105.8758	112.6403	120.2786	123.7060	(72)
Total internal gains	481.0933	478.8862	463.2772	437.9248	411.8915	386.9922	370.9254	377.3241	390.4375	416.0189	445.4473	467.7994	(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					6.0700	10.6334		0.6300	0.7000	0.7700		19.7257 (74)	
East					7.4500	19.6403		0.6300	0.7000	0.7700		44.7173 (76)	
South					10.6400	46.7521		0.6300	0.7000	0.7700		152.0247 (78)	

Solar gains	216.4677	374.1506	525.2704	671.4471	769.6232	771.4375	740.7019	666.5536	575.8692	417.2168	260.2925	184.5810	(83)
Total gains	697.5610	853.0369	988.5476	1109.3719	1181.5147	1158.4297	1111.6273	1043.8777	966.3067	833.2357	705.7398	652.3804	(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	55.1575	55.3195	55.4791	56.2415	56.3865	57.0713	57.0713	57.1999	56.8055	56.3865	56.0940	55.7914
alpha	4.6772	4.6880	4.6986	4.7494	4.7591	4.8048	4.8048	4.8133	4.7870	4.7591	4.7396	4.7194
util living area	0.9968	0.9915	0.9773	0.9342	0.8328	0.6600	0.4952	0.5449	0.7884	0.9581	0.9928	0.9977 (86)
MIT	19.6748	19.8813	20.1764	20.5328	20.8090	20.9543	20.9906	20.9854	20.8920	20.5196	20.0274	19.6428 (87)
Th 2	19.8731	19.8760	19.8788	19.8923	19.8948	19.9066	19.9066	19.9088	19.9020	19.8948	19.8897	19.8844 (88)
util rest of house	0.9958	0.9887	0.9694	0.9111	0.7777	0.5650	0.3771	0.4235	0.7045	0.9386	0.9899	0.9969 (89)
MIT 2	18.1225	18.4248	18.8521	19.3602	19.7153	19.8777	19.9034	19.9032	19.8210	19.3547	18.6486	18.0837 (90)
Living area fraction												
MIT	18.7470	19.0108	19.3849	19.8319	20.1552	20.3108	20.3407	20.3386	20.2518	19.8233	19.2033	18.7109 (91)
Temperature adjustment												
adjusted MIT	18.7470	19.0108	19.3849	19.8319	20.1552	20.3108	20.3407	20.3386	20.2518	19.8233	19.2033	18.7109 (92)
												0.0000
												18.7109 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	693.5324	840.8510	953.9078	1009.1273	935.7675	697.0725	472.3138	493.3915	709.0541	780.7377	696.8758	649.5709	(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	1906.2151	1856.3987	1690.2443	1414.6157	1091.3151	728.2519	477.0228	501.1180	788.1576	1190.4526	1570.3108	1892.8914	(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	902.2359	682.4480	547.8344	291.9516	115.7274	0.0000	0.0000	0.0000	0.0000	304.8279	628.8733	925.0305	(98)
Space heating												4398.9290	(98)
Space heating per m2												41.9745	(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													4704.7369 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	902.2359	682.4480	547.8344	291.9516	115.7274	0.0000	0.0000	0.0000	0.0000	304.8279	628.8733	925.0305	(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)	964.9582	729.8910	585.9191	312.2477	123.7726	0.0000	0.0000	0.0000	0.0000	326.0192	672.5917	989.3374	(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	212.7264	187.4612	196.7893	176.2889	172.6708	154.1632	147.9390	162.4981	162.2623	182.8073	193.4505	207.5680	(64)
Efficiency of water heater (217)m	88.2425	87.9585	87.4028	86.1509	83.7746	79.8000	79.8000	79.8000	79.8000	86.1686	87.7326	79.8000	(216)
Fuel for water heating, kWh/month	241.0702	213.1247	225.1522	204.6280	206.1135	193.1870	185.3872	203.6317	203.3362	212.1507	220.5000	234.9930	(219)
Water heating fuel used												2543.2745	(219)
Annual totals kWh/year													
Space heating fuel - main system												4704.7369	(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)												415.4326	(232)
Total delivered energy for all uses												7738.4440	(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	4704.7369	0.2160	1016.2232 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2543.2745	0.2160	549.3473 (264)
Space and water heating			1565.5705 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	415.4326	0.5190	215.6095 (268)
Total CO2, kg/m2/year			1820.1050 (272)
Emissions per m2 for space and water heating			14.9386 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.0573 (272b)
Emissions per m2 for pumps and fans			0.3714 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.9386 * 1.00) + 2.0573 + 0.3714, rounded to 2 d.p.			17.3700 (273)



/O

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